Geological Survey of Canada
Economic Geology Report 37

# CLASSIFICATION, DISTRIBUTION AND GRADE-TONNAGE SUMMARIES OF CANADIAN LEAD-ZINC DEPOSITS

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1986

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Available in Canada through

authorized bookstore agents and other bookstores

or by mail from

Canadian Government Publishing Centre
Supply and Services Canada
Ottawa, Canada K1A 0S9

and from

Geological Survey of Canada offices:

601 Booth Street
Ottawa, Canada K1A 0E8

3303-33rd Street N.W.,
Calgary, Alberta T2L 2A7

100 West Pender Street
Vancouver, British Columbia V6B 1R8
(mainly B.C. and Yukon)

A deposit copy of this publication is also available
for reference in public libraries across Canada

Cat. No. M43-37/1986E Canada: $12.00
ISBN 0-660-12152-2 Other countries: $14.40

Price subject to change without notice

Cette publication est aussi disponible en français

**Cover**

Skeletal galena crystal in a matrix of botryoidal sphalerite, Pine Point district, Northwest Territories. Length of crystal is 10 cm. Photographed by G. Lemieux.

**Critical Reader**

*H.E. Dunsmore*

***Original manuscript submitted for publication: 1983-11***
***Final version approved for publication: 1984-07***

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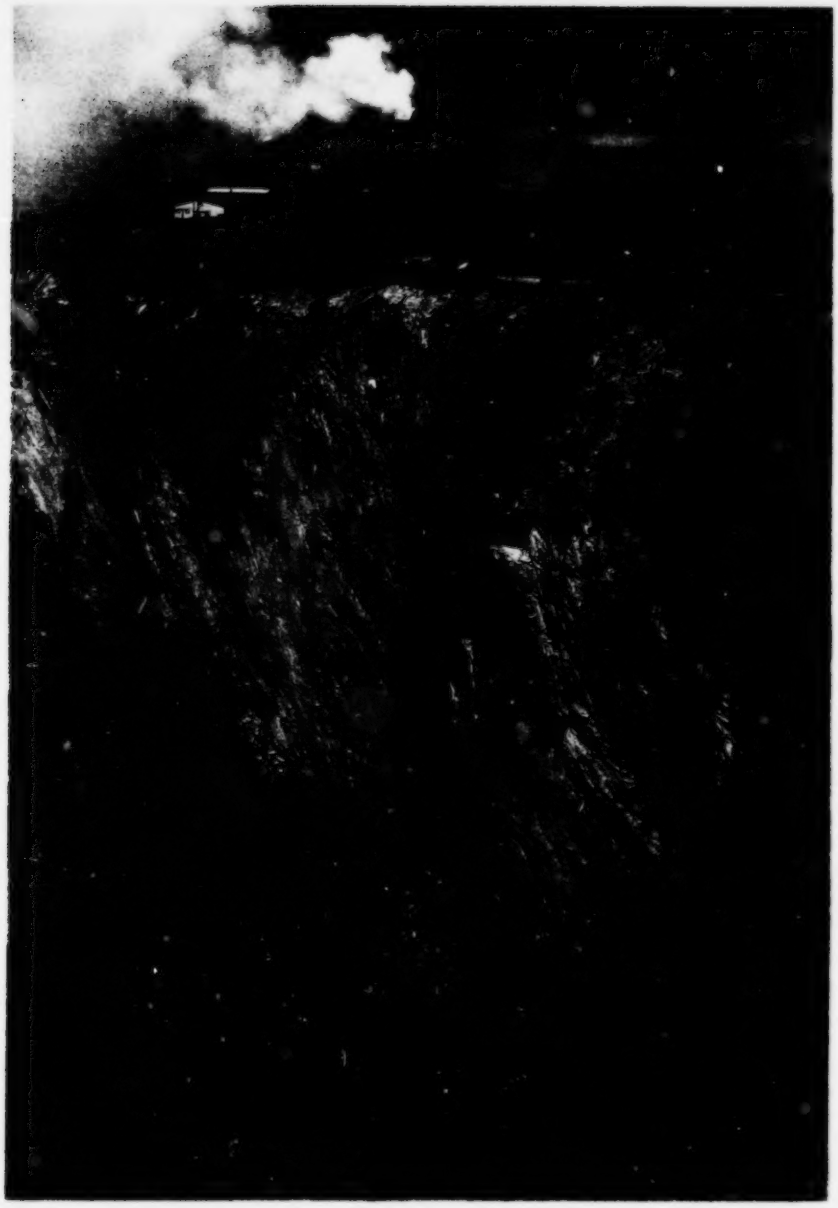

***Figure 1.*** *Flin Flon Mine, Manitoba; North Main Shaft and glory hole. The orebody, a Middle Proterozoic volcanic-associated exhalative deposit, plunges to the south towards, and to the right of, the observer. The deposit was discovered in 1914 and has been in continuous production since 1930.*

# CLASSIFICATION, DISTRIBUTION AND GRADE-TONNAGE SUMMARIES OF CANADIAN LEAD-ZINC DEPOSITS


**Abstract**

*A summary overview of certain quantifiable characteristics of Canadian lead-zinc deposits and occurrences is presented by means of maps, graphs and explanatory text.*

*A total of 378 lead-zinc deposits, defined as mineral concentrations for which grade and tonnage data are available for these elements, have been assigned to one of six deposit-type categories: (i) sandstone-lead; (ii) contact metasomatic; (iii) Mississippi Valley; (iv) sediment-hosted exhalative; (v) volcanic-associated exhalative; and (vi) vein/replacement.*

*Deposits are plotted on a 1:5 million scale geological map with symbols depicting deposit-type, total (Pb+Zn) content, and Zn/(Zn+Pb) ratio. Crowded areas of deposit-clusters are shown on a series of more detailed geological maps.*

*The 4900 lead-zinc occurrences (no grade-tonnage data available) recorded in CANMINDEX, the GSC computer-based mineral deposits file, were simply contoured by a moving average technique and are displayed as a density contour map.*

*The study showed that:*

1. *A majority of all deposits are decidedly copper-poor relative to lead-zinc;*
2. *Volcanic-associated deposits, as a group, are largely bimetallic Cu-Zn whereas all other deposit-types are bimetallic Pb-Zn;*
3. *Volcanic-associated exhalative and vein/replacement deposits are the two most abundant deposit-types, constituting 47% and 37%, respectively, of the total deposit population;*
4. *Vein/replacement deposits account for the majority of size less than 100 000 tonnes ore; deposits larger than this are mainly of the exhalative type;*
5. *The median size of all Canadian lead-zinc deposits is 0.5 million tonnes ore;*
6. *A majority of deposits grade less than 18% (Pb+Zn);*
7. *The average (Pb+Zn) grade of sediment-hosted exhalative deposits (10.07%) is more than double that of volcanic-associated exhalative deposits (4.94%); vein/replacement deposits not subjected to hand-picking of ore material average 8.58%.*
8. *Contour plots of 4912 lead-zinc occurrences show that most coincide with deposit-clusters.*

*The report includes three appendices which: (i) list deposits by type with cross-referencing by name and deposit-number including latitude, longitude and National Topographic System (NTS) location data for each deposit; (ii) list deposits alphabetically by deposit-type; and (iii) record selected bibliographic references for each deposit for a total of 748 citations.*


## INTRODUCTION

This report summarizes the distribution and nature of Canadian mineral deposits reported to contain lead and/or zinc. Exploration for lead-zinc in Canada began before Confederation in 1867 and the latest data available (1981) show that the country ranks third and first in the world in lead and zinc mine production, respectively. Some deposits have been producing zinc for over fifty years (Fig. 1). Latest estimates (Energy, Mines and Resources Canada, 1977) of the nation's lead-zinc endowment suggest Canada's continued dominance as a world lead-zinc resource nation.

For this report, Canadian lead-zinc mineral concentrations were divided into two categories: deposits and occurrences. Deposits are those for which grade and tonnage data for lead and/or zinc are available. Published reserves were combined with cumulative production (where applicable) to end 1981 to arrive at combined grade-tonnage figures which were then used for illustration and statistical purposes. A total of 378 deposits were found to fulfill these criteria. Occurrences are those which have been reported to contain lead and/or zinc but without grade-tonnage data and which have been entered into CANMINDEX, the Geological Survey of Canada's computer-based index file of Canadian mineral occurrences and deposits. Of a total of approximately 19 400 entries in CANMINDEX as of early 1984, about 4900 have recorded lead and/or zinc.

The two categories of mineral concentrations (deposits and occurrences) are treated differently in this report. The 378 deposits are plotted on a series of maps (Map 1651A and Fig. 2-10) with symbols depicting deposit-type, total (Pb + Zn) content, and Zn/(Zn + Pb) ratio. In Appendix A, the deposits are listed by deposit-type, cross-referenced by name, and assigned a deposit-number. Appendix B lists the same deposits alphabetically by deposit-type. Appendix C consists of a selected bibliography for all deposits. Furthermore, the distribution of individual deposits throughout Canada is shown in Map 1651A with details of selected districts shown in Figures 2-10. In contrast to the deposits, the 4900 occurrences were simply computer-contoured by a moving average technique and displayed as a density contour map.

## DEPOSIT CLASSIFICATION

### *Compositional types*

In the 378 deposits, lead and zinc are not, of course, the only commodities present Many contain significant amounts of silver, gold, and cadmium as potential or actual byproducts. Other commodities present in a few deposits are tin, bismuth, selenium, and barite. Copper is an

Note: reference to Figure 1 in caption for Figures 2-10 should read Map 1651A

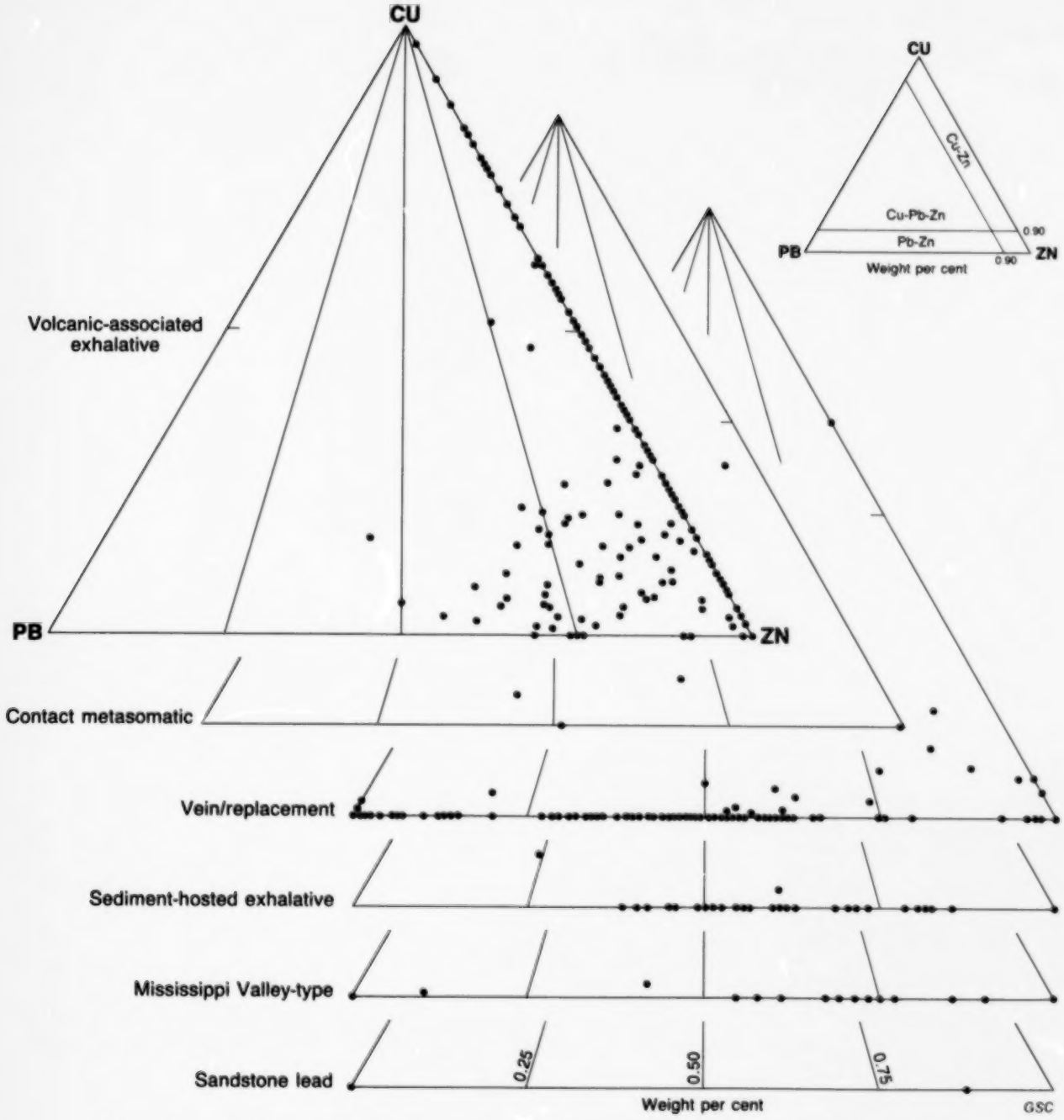


***Figure 11.*** *Ternary plots of relative Cu-Pb-Zn abundances in Canadian lead-zinc deposits. Due to crowding and overlapping of points, the positions of some deposits could not be shown on the diagrams. Radiating lines are same divisions of Zn/(Zn+Pb) ratios as used in deposit-symbols on distribution maps. Small triangle in upper right corner shows compositional divisions discussed in text and used in Table 1.*

accompanying base metal in about one half of the 378 deposits considered in this report (Fig. 11). However, the sole compositional criterion used for inclusion in this report was that the deposits contain lead or zinc. In actual fact, over 92% of them contain more combined lead-zinc than copper (i.e. (Pb+Zn)>Cu). Using the compositional boundaries shown in the upper right corner of Figure 11, Canadian lead-zinc deposits can be grouped into four compositional types: (i) bimetallic Cu-Zn; (ii) bimetallic Pb-Zn; (iii) monometallic Zn; and (iv) polymetallic Cu-Pb-Zn. Table 1 lists the percentage distribution, by deposit-type, in these four compositional types (see following section for definitions of deposit-types).

### *Metallogenic types*

All the lead-zinc deposits considered in this report are regarded by the author to be of the type referred to as "hydrothermal"; that is to say, the metals have been transported in solution by, and deposited from, aqueous solutions. This is not to imply that non-hydrothermal types of lead-zinc deposits do not occur in Canada; quite the contrary. It reflects the fact that other metallogenic types have not been investigated to the point where grade-tonnage calculations have been made and reported.

Within the "hydrothermal" category, a second-order hierarchy classifies the deposits as either "supracrustal" or "infracrustal" (Table 2). Supracrustal deposits are those formed on the Earth's crust whereas infracrustal deposits are formed within the crust. Two types of supracrustal Canadian lead-zinc deposits are recognized: volcanic-associated exhalative deposits and sediment-hosted exhalative deposits. In the infracrustal category, four sub-types are recognized: contact metasomatic; vein/replacement; Mississippi Valley-type; and sandstone-lead.

The 378 deposits of this report were each assigned to one of these six basic metallogenic deposit-types, the geological characteristics of which are described below.

### Supracrustal deposits

#### *1. Volcanic-associated and sediment-hosted exhalative*

Within the supracrustal category, all Canadian lead-zinc deposits are regarded as being of the type commonly referred to as "exhalative". Deposits of this type are considered to have formed in a subaqueous environment, usually submarine, by precipitation of metal sulphides from hot, aqueous solutions emanating from fissures on the seafloor. The characteristics of these deposits, and the processes as by which they have formed, have been discussed most recently by Franklin et al. (1981), Large (1980; 1981; 1983) and Gustafson and Williams (1981). Canadian supracrustal exhalative deposits are assigned to one of two categories: (i) volcanic-associated, in which volcanic rocks constitute a significant proportion of the host rocks; (ii) sediment-hosted, in which a recognizable volcanic component in the host rocks is negligible and the entire sequence is overwhelmingly sedimentary. Some authors have suggested a complete spectrum of host-rock proportions exists between these two end-members (e.g. Gilmour, 1971, 1976; Klau and Large, 1980). Alternatively, Franklin et al. (1981) have shown that, in terms of Cu-Pb-Zn ratios, exhalative deposits exhibit three main compositional categories: Cu-Zn; Cu-Pb-Zn; and Pb-Zn. The first two of these compositional categories broadly correspond to the volcanic-associated type of the present report and display the characteristics discussed by Franklin et al. (1981). The third compositional category corresponds to the sediment-hosted type of the present report and display the features discussed by Large (1980; 1981; 1983).

**Table 1.** Compositions of Canadian lead-zinc deposits (see Fig. 11). Numbers refer to percent of total in each deposit type

| Deposit type | n | Composition %Pb-Zn | %Cu-Zn | %Zn | %Cu-Pb-Zn |
|---|---|---|---|---|---|
| Sandstone-lead | 2 | 100 | - | - | - |
| Contact metasomatic | 7 | 43 | 14 | 43 | - |
| Mississippi Valley (MVT) | 16 | 94 | - | 6 | - |
| Sediment-hosted exhalative | 33 | 85 | - | 15 | - |
| Volcanic-associated exhalative | 180 | 16 | 58 | 16 | 10 |
| Vein/replacement | 140 | 89 | 1 | 9 | 1 |
| All deposits | 378 | 53 | 29 | 13 | 5 |

The table above illustrates the following relationships:

1. Sandstone-lead, Mississippi Valley-type (MVT), sediment-hosted exhalative, and vein/replacement deposit types are dominantly of bimetallic Pb-Zn composition;
2. Volcanic-associated exhalative deposits are largely of the bimetallic Cu-Zn type, due, in large part, to the fact that many of the deposits are of Precambrian age and hence characteristically lead-poor;
3. Only five per cent of all deposits are polymetallic Cu-Pb-Zn of which all but one are of the volcanic-associated exhalative type;
4. A majority of all deposits (66%) are decidedly copper-poor relative to lead-zinc (i.e. Cu/(Cu+Pb+Zn)<0.10).

**Table 2.** Metallogenic classification of Canadian lead-zinc deposits

| Classification | Canadian examples |
|---|---|
| HYDROTHERMAL | |
| Supracrustal | |
| . Volcanic-associated exhalative | Buchans, Brunswick #12 |
| . Sediment-hosted exhalative | Sullivan, Cirque |
| Infracrustal | |
| . Mississippi Valley-type (MVT) | Pine Point, Newfoundland Zinc |
| . Sandstone-lead | Yava |
| . Contact metasomatic | Meat Cove, Zip |
| . Vein and replacement | Nigadoo, Bluebell |

Briefly, exhalative deposits consist of two main portions: massive sulphides and stringer sulphides. The former is a lens of high sulphide content (normally more than 20% sulphide, most of which is iron sulphide), internally layered, and conformable with enclosing rocks. The stringer sulphide portion occurs in the footwall of the massive sulphide lens, is much lower in sulphide content (about 20% total sulphide), discordant to enclosing rocks, and may consist of a vein stockwork, sulphide cement in brecciated host rocks, disseminations, or various proportions of all three. The stringer sulphide portion is characteristically surrounded by an envelope of hydrothermally altered host rocks. For further details of volcanic-associated exhalative deposits, the reader is referred to Franklin et al. (1981). Sediment-hosted exhalative deposits are similar to the volcanic-associated ones except that the stringer sulphide portion is much less common and the massive sulphide portion is usually represented by a series of stacked, thin, conformable sulphide layers rather than a single, lensoid mass (Large, 1980, 1981, 1983; Klau and Large, 1980).

Canadian volcanic-associated deposits include those associated with ophiolitic assemblages (e.g. York Harbour), with tholeiitic and calc-alkaline mafic-to-felsic sequences (e.g. Mattabi), and with mixed volcanic and sedimentary lithologies (e.g. Brunswick #12). This wide range in volcanic rock-types and lithologic assemblages reflects the wide range of depositional and tectonic environments in which these deposits form (Franklin et al., 1981). Similarly, sediment-hosted exhalative deposits are found in radiolarian cherts, shales, and carbonates (e.g. Howard's Pass), in argillites and sandstones of turbidite affiliation (e.g. Sullivan), in carbonates (e.g. Jersey), and calcareous quartzites (e.g. River Jordan). Although there is a degree of consensus that the tectonic environment of sediment-hosted exhalative deposits is some form of intra-cratonic rifting (Large, 1980), the depositional environment ranges from deep-water basins with severly limited clastic input (e.g. Howard's Pass), through basins of moderate water depth receiving large volumes of greywacke-like detritus (e.g. Sullivan), to, finally, relatively shallow-water carbonates and calcareous quartzites (e.g. Jersey, River Jordan).

**Infracrustal deposits**

*1. Vein and replacement*

Vein deposits consist most commonly of narrow, subvertical structures such as fractures, shears, faults, etc. which are filled, either partially or completely, with sulphide minerals and associated silicates, carbonates, or sulphates. The veins are discordant where they occur in layered host rocks; veins in plutonic rocks appear to be later than all phases of intrusion.

Host rocks are most commonly clastic metasedimentary rocks and felsic plutonic rocks. Contacts between veins and silicic host rocks are characteristically abrupt and relatively straight, suggesting structural control of the mineralized zone. Under these conditions alteration and replacement of adjacent country rock is minimal. Where the host rock is carbonate (or calcareous), however, ore-host contacts are irregular, structural control is not so apparent, and replacement features are common. Thus, in a mixed sedimentary sequence, a single lode may exhibit both vein and replacement characteristics, depending on adjacent host rock lithology and, for this reason, both forms are grouped together.

A majority of Canadian lead-zinc vein and replacement deposits are associated with felsic plutons although a clear genetic connection has never been established. This type of vein deposit has, as a group, been the most consistent producer in the vein/replacement category. Two districts, in particular, are noteworthy: the Keno Hill district in Yukon Territory (Fig. 10) and the Salmo and Slocan district in southeastern British Columbia (Fig. 8). Both of these districts consist of a collection of individual veins and vein-nets associated with Laramide-age intrusions and hosted in clastic sedimentary rocks. Vein deposits in the Keno Hill district are the most important vein/replacement, silver producers in Canada and, as they also contain high lead-zinc values, constitute a significant lead-zinc resource. The Lucky Jim and Bluebell would be examples of vein deposits contained partially (Lucky Jim) or almost entirely (Bluebell) in carbonate rocks and which, consequently, exhibit both vein and replacement characteristics. However, some deposits, such as the Frontenac and Kingdon, are not associated with igneous rocks of any kind and may be genetically related to the St. Lawrence Rift System (A.L. Sangster, 1970; D.F. Sangster, 1970; Kumarapeli, 1976). Other, non-pluton-associated vein deposits, such as some in the Thunder Bay region (e.g. Dorion), are vein-like in form, but have been proposed (Franklin and Mitchell, 1977) to be genetically similar to sandstone-lead deposits (Bjørlykke and Sangster, 1981). That is to say, the vein constituents (Pb, Zn, Ba, etc.), derived from diagenic breakdown of potash feldspar grains within the host rock sandstones, were moved as soluble complexes in formation fluids to their present locations in dilation zones adjacent to basement paleo-highs at the margins of the sedimentary basin.

*2. Contact metasomatic*

Although commonly referred to as skarn deposits, contact metasomatic lead-zinc deposits are only one of several types of skarn deposit. They may form by any of three main processes: (i) metamorphic recrystallization of impure carbonate rocks; (ii) bimetasomatic reaction between unlike lithologies; (iii) infiltrational metasomatism involving hydrothermal fluids of magmatic origin (Einaudi et al., 1981).

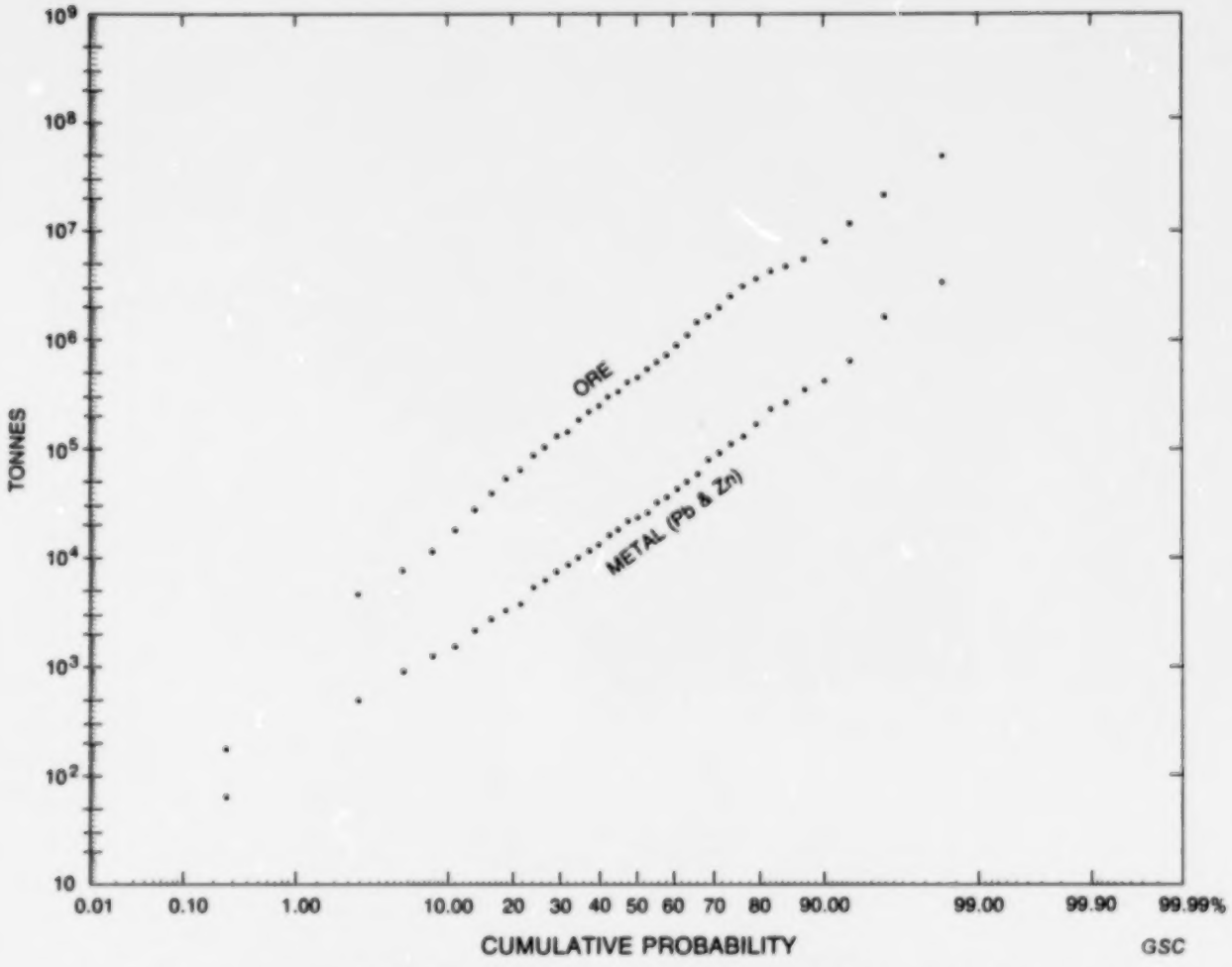


***Figure 12.*** *Probability plot of tonnes ore and contained lead-zinc in 378 Canadian lead-zinc deposits. To avoid clutter of the diagram, only every tenth point has been plotted.*

In the present paper, an attempt is made to separate lead-zinc deposits formed by infiltrational metasomatism (i.e. contact metasomatism) from the other two which the author regards as simply metamorphism of pre-existing lead-zinc deposits and host rocks. An example of the latter would be the Long Lake deposit classified here as a (metamorphosed) sedimentary exhalative deposit. Canada's largest known contact metasomatic lead-zinc deposit is Meat Cove.

### *3. Mississippi Valley-type*

Named after several well-known districts in the Mississippi Valley region of the United States, Mississippi Valley-type (MVT) deposits may be broadly described as low-temperature, epigenetic, open-space fillings in carbonate rocks. The deposits are not normally associated with igneous rocks and alteration of carbonate rock adjacent to the deposits is characteristically lacking. Sulphides of simple mineralogy (pyrite, sphalerite, galena), accompanied by dolomite, calcite and minor quartz, occur as cement to carbonate breccias, usually interpreted as karst-controlled solution collapse breccias.

The geological characteristics of MVT deposits have been discussed by Ohle (1959), Snyder (1968), and Anderson and Macqueen (1982). Sangster (1983) reviewed the geology of MVT deposits and proposed a classification based on metal ratios and local geology.

Canadian MVT deposits are found in rocks ranging in age from Neohelikian to Early Carboniferous. The largest group in Canada is the Pine Point district consisting of about 40 individual deposits within a 10 by 48 km area. It is the only world-class MVT district in Canada; most other deposits of this type in the country are miniscule by comparison with districts in other countries.

### *4. Sandstone-lead*

Occurring as disseminated, pyrite-poor, low-silver, lead-dominant deposits in well-sorted quartzitic sandstones of a transgressive sequence (Bjørlykke and Sangster, 1981), sandstone-lead deposits are relatively unimportant in Canada. Only two have reported tonnage-grade data: the Aphebian George Lake and Late Carboniferous Yava deposits. The George Lake deposit is anomalous in that, despite possessing

all the definitive characteristics of sandstone-lead deposits described by Bjørlykke and Sangster (1981), the deposit is zinc-dominant rather than lead-dominant. The reasons for this are unclear; it could be a function of the association with a relatively lead-poor Archean basement or, conversely, it could simply represent the zinc-rich portion of a zoned deposit. Marked compositional zoning, resulting in portions of orebodies possessing almost complete reversals in lead-zinc ratios relative to the deposit(s) as a whole, are well documented in several deposits of this type elsewhere in the world (see Bjørlykke and Sangster, 1981, p. 201).

## DEPOSIT DISTRIBUTION MAPS

### *Symbols*

On Map 1651A and Figures 2-10, the distribution of 378 Canadian lead-zinc deposits are shown by symbols which also convey information about deposit size, deposit type, and metal ratio.

#### 1. Location and deposit-number

The locations of most deposits are shown by the positions of the symbols on Map 1651A and Figures 2 to 10. In crowded areas, the position of the deposit is shown by a dot joined to the appropriate symbol with a short line. Exact locations are listed in Appendices A and B.

Each deposit has also been assigned a unique number consisting of two parts (e.g. 11-042). The first part is the Canadian National Topographic System (NTS) primary block number corresponding to that in which the deposit lies and which is displayed in the centre of the NTS blocks in Map 1651A. The second part is a unique number assigned to each deposit within each NTS block. Thus, for example, all deposits in NTS 31 are preceded by the number 31 and each deposit is assigned a unique number after that e.g. 31-006, 31-012, etc.

Wherever possible, the deposit-number and symbol refers to an individual deposit. In some cases, however, this was not possible and a symbol and number actually represent a group of deposits. The main reason for grouping deposits in this manner is that grade-tonnage data were reported for the group and not for individual deposits. An example is the Pine Point district (85-002) where over 40 geologically distinct deposits are represented by a single symbol.

#### 2. Deposit-type

The six third-order categories of deposit-types (Table 2) are depicted by different symbol shapes as shown in the legend for Map 1651A.

In most instances, little difficulty was experienced in assigning deposits to one type or the other. Provided geological information was available about any individual deposit, either through published descriptions or personal observation by the author, the geological features described previously were sufficient to classify the deposit. Some deposit-types are, by their nature, characterized by features which could be ascribed to two or more of the six deposit-types in Table 2. For example, the footwall stringer zone of exhalative deposits could be said to contain features of vein/replacement deposits. Similarly, virtually all MVT deposits contain at least minor replacement characteristics. However, in order to assign each deposit to only one category, the author classified deposits according to their definitive geological characteristics. Thus, all MVT deposits are mainly open-space fillings in carbonate rocks; replacement and vein-like features are subordinate. All exhalative deposits possess, as their definitive criterion, a massive sulphide zone, usually internally layered but always conformable. In some instances the definitive criteria are not the dominant feature of a deposit. For example, the Sullivan deposit (82-055) is classified as an exhalative deposit even though the discordant footwall tourmalinite zone exceeds in size the massive, layered, lead-zinc zone above it (Hamilton et al., 1983, p. 71).

#### 3. Size

The size of each deposit, calculated as the tonnes of lead and zinc metal in combined reserves plus production, is characterized by the symbol size for that deposit. Before a decision was made on the number of size categories to be depicted and on the tonnage range in each category, a search was made to identify any natural "breaks" in the size population of the 378 deposits. A probability plot (Fig. 12) revealed no significant breaks in the cumulative probability curve, thereby indicating a single population. With no natural divisions apparent, the decision was made to divide the size population into an arbitrary number of size ranges. To depict the smallest and largest deposit-size ranges in Map 1651A, the smallest and largest symbol was selected on an esthetic and cartographic basis. It was then found, by experiment, that three was the optimum number of symbol sizes, between the largest and smallest, that could readily be distinguished by eye. By this process, the number of metal tonnage categories was chosen to be five and the entire metal tonnage range depicted in Figure 12 was consequently divided into five equal size ranges.

#### 4. Metal ratio

Inasmuch as the deposit-size depicted by the symbols in Map 1651A and Figures 2-10 refers to combined lead-zinc, it is important to indicate, as well, the relative proportion of these metals in a given deposit. Accordingly, the $Zn/(Zn + Pb)$ ratio for each deposit was calculated and assigned to one of four categories between 0 and 1: $< 0.25$, 0.25-0.499, 0.50-0.75 and $> 0.75$. Each symbol, therefore, depicts these four metal-ratio categories as shown in the legend for Map 1651A. These metal-ratio divisions are also shown by the radiating lines in the ternary plots of relative metal abundances (Fig. 11).

### *Discussion*

Inspection of Map 1651A clearly reveals the very uneven distribution of Canadian lead-zinc deposits, particularly when those deposits shown on the detailed maps (Fig. 2-10) are taken into consideration. Major clusters are evident in NTS blocks 21, 32, 63, 82, and 105, representing major deposit-clusters in the Bathurst, Val d'Or-Noranda-Matagami, Flin Flon-Snow Lake, southeastern British Columbia, and Selwyn Basin-Keno Hill regions respectively.

Deposit-clusters in the Canadian Shield are all composed of volcanic-associated exhalative deposit-types, a characteristic feature of these deposits discussed by Sangster (1980). Clusters shown in NTS block 82 (Fig. 8 and 9) are mostly due to vein-replacement deposits; Sinclair (1974) has reviewed the clustering statistics of some districts. Clusters of MVT deposits are known to occur at Pine Point (85-002), Robb Lake (94-004), and Newfoundland Zinc (12-006) but, because of the nature of reporting grade-tonnage for these districts, they are shown as a single deposit.

Volcanic-associated exhalative deposit-clusters are thought to be at least partly controlled by volcanic centres or caulderas (Sangster, 1980; Harley, 1979; Ohmoto, 1978). Certain vein-replacement clusters are spatially, and probably genetically, related to felsic igneous intrusions (e.g. Keno Hill, Fig. 10).

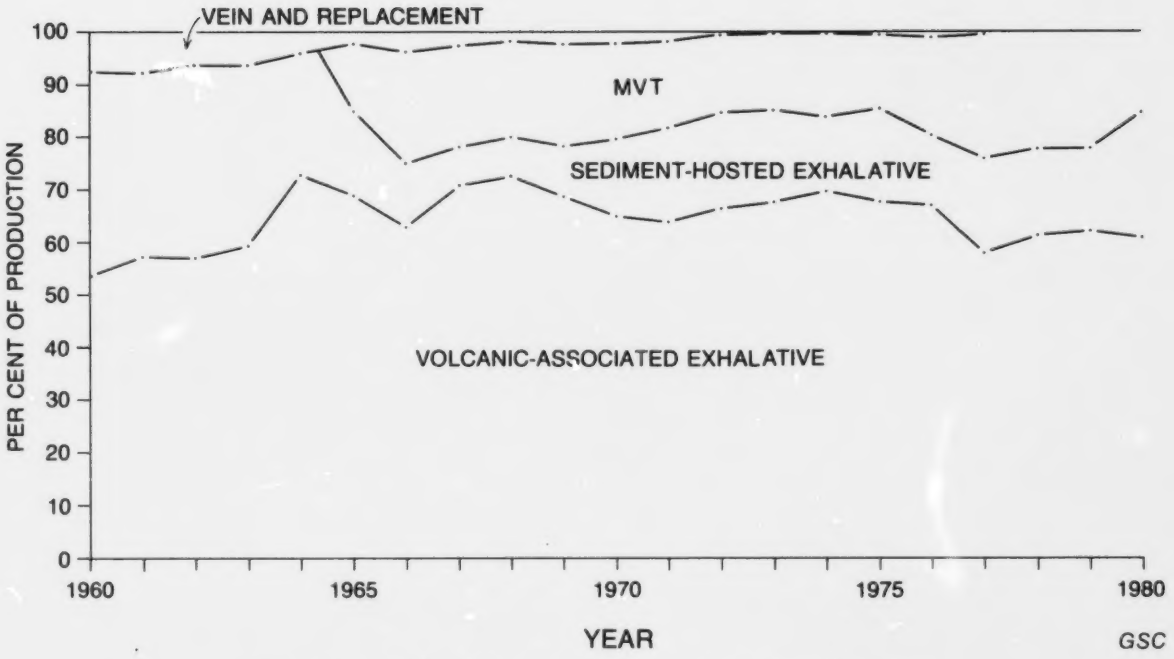


***Figure 14.*** *Canadian mine production of zinc by deposit-type, 1960-80.*

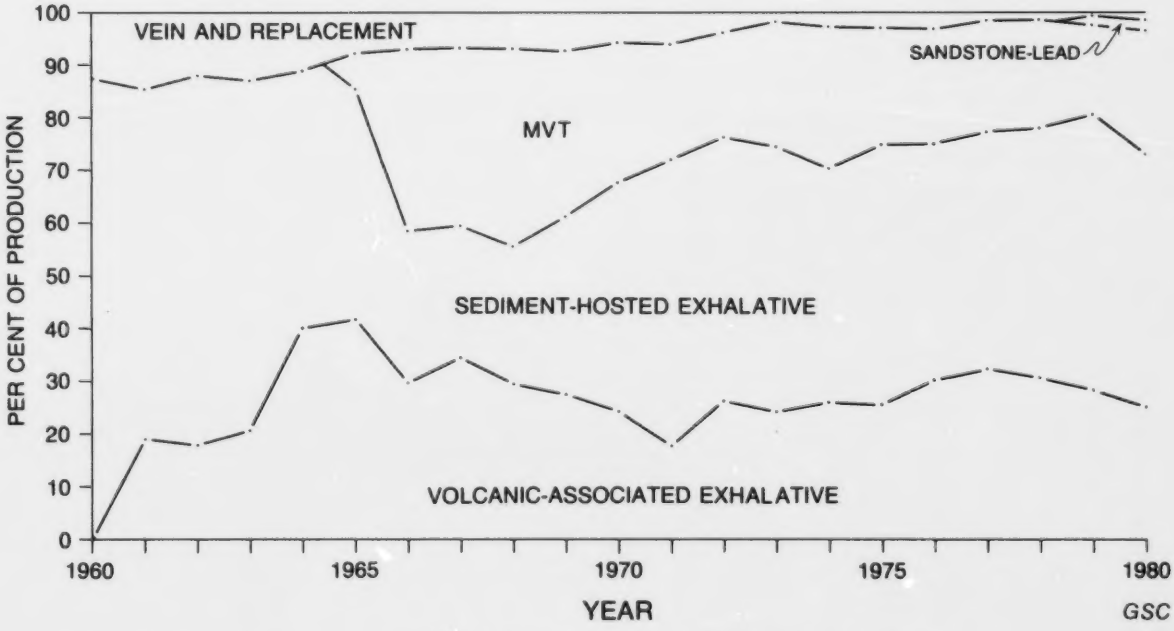


***Figure 15.*** *Canadian mine production of lead by deposit-type, 1960-80.*

Although many occurrences are known, vein-replacement deposits are scarce in, and contact metasomatic deposits totally absent from, the Canadian Shield. Absence of the latter type may be due to the relative paucity of carbonate rocks in Precambrian orogenic belts but the reason for the scarcity of vein-replacement deposits is not obvious. Felsic intrusions in clastic sediments, the association typical of lead-zinc veins in the Cordillera, are abundant in the Shield, but are not as yet accompanied by mining districts comparable to the Keno Hill or Slocan districts in the Cordillera.

## OCCURRENCE DISTRIBUTION MAP

In addition to the 378 deposits, the distribution of 4912 lead-zinc occurrences is summarized on a computer-contoured map of Canada (Fig. 13).

To produce this contour map, the following steps were taken:

1. the CANMINDEX file (Picklyk et al., 1978) was searched using the criterion that one of the reported commodities must be lead or zinc. Out of 18 387 records in the file, 4912 satisfied this condition;
2. the geographic coordinates for these occurrences were extracted;
3. the data were processed with a program whose output would be directly processible by GPCP (General Purpose Contouring Program);
4. the contour map was then produced by running GPCP on the processed data.

**Table 3.** Distribution of Canadian lead-zinc deposits by deposit-type

| Deposit-type | % of total |
|---|---|
| Sandstone-lead | 0.5 |
| Contact metasomatic | 1.9 |
| MVT | 4.2 |
| Sediment-hosted exhalative | 8.7 |
| Volcanic-associated exhalative | 47.6 |
| Vein and replacement | 37.0 |
| | 99.9 |

A special program was written, in FORTRAN language, to transform point data extracted from CANMINDEX into gridded data which would represent the density of mineral occurrences within a grid element. After some experimentation with the size of grid cells and contouring intervals, a cell size of 30 km to the side and a map scale of 1:8 870 400 were selected (Fig. 13). For the moving average technique, the value assigned to each grid unit is the arithmetic mean of the nine grid values, the central unit plus the eight surrounding grid units. Contour intervals are successive powers of two: 1, 2, 4, 8, and 16. To avoid having non-zero grid values at the map edge, the border of the grid was tangent to the 44th parallel of latitude; the central north-south line followed the 92nd meridian of longitude.

### *Discussion*

From the data summarized in Figure 13, it is apparent that most concentrations of lead-zinc occurrences coincide with the major deposit-clusters. In several instances, however, the occurrence peaks and deposit clusters do not coincide and it is worthwhile to examine several examples of this anomaly.

The occurrence peak in the Burin Peninsula of Newfoundland (NTS 1) is not mirrored by a cluster of lead-zinc deposits. Examination of the CANMINDEX data reveals that the occurrences reported in this region are, in fact, the fluorite veins of the St. Lawrence fluorspar district (Williamson et al., 1957; Van Alstine, 1944) in which lead and zinc occur as accessory galena and sphalerite.

Other examples include the occurrence peak northeast of Yellowknife (NTS 85) which is produced by a concentration of base-metal-bearing gold veins. The peak of lead-zinc occurrences in the southwest corner of NTS 94 west of the Robb Lake (94-004) and Cirque (94-005) deposits is dominated by a group of base metal vein and contact metasomatic occurrences.

Conversely, some deposit-clusters are not surrounded by occurrence contours such as that in the northwest corner of NTS 82. Situations such as this are very likely caused by one or both of two reasons: (i) the average number of reported occurrences per cell is less than one; or (ii) mineral occurrences in the area in question have not yet been coded and entered into the CANMINDEX file.

**Table 4.** Percentage distribution of lead-zinc deposits by size and deposit-type

| | No. deposits per deposit-type (% of total) | | | | | | |
|---|---|---|---|---|---|---|---|
| Tonnes ore | sand-stone lead | contact meta-somatic | vein/ replace-ment | MVT | sediment-hosted exhalative | volcanic-associated exhalative | Total |
| less than $10^4$ | 0 | 0 | 100 | 0 | 0 | 0 | 100 |
| $10^4$ to $10^5$ | 0 | 2.86 | 75.71 | 1.43 | 10.00 | 10.00 | 100 |
| $10^5$ to $10^6$ | 0 | 2.19 | 37.23 | 4.38 | 3.65 | 52.55 | 100 |
| $10^6$ to $10^7$ | 1.83 | 1.85 | 7.34 | 5.50 | 12.84 | 70.64 | 100 |
| $10^7$ to $10^8$ | 0 | 0 | 0 | 10.00 | 16.67 | 73.33 | 100 |
| $10^8$ to $10^9$ | 0 | 0 | 0 | 0 | 50.00 | 50.00 | 100 |

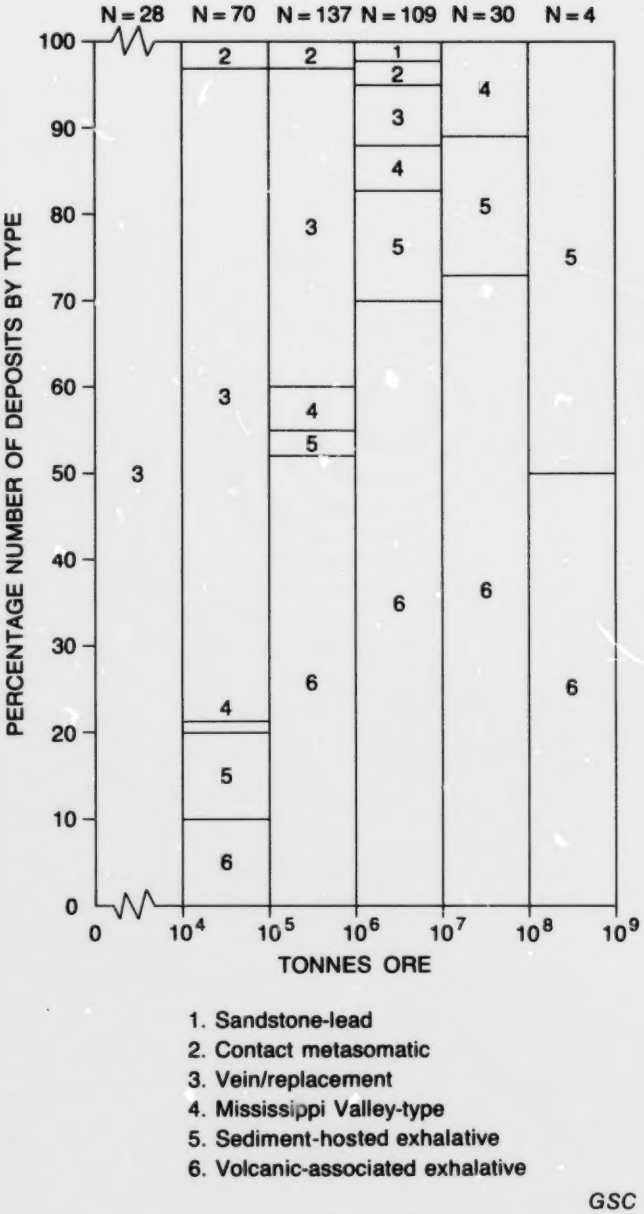


***Figure 16.*** *Distribution of Canadian lead-zinc deposits by size (tonnes ore) and deposit-type. Number of deposits in each size category is given at top of each column.*

## STATISTICAL SUMMARY

### *Production by deposit-type*

As noted earlier, Canada has long been one of the leading world producers of both lead and zinc. However, the source of these metals, from a geological stand-point, has changed considerably over the years. Figures 14 and 15 illustrate the percentage of annual production, during the period 1960-80, derived from the deposit-types considered in this study for each of the two metals.

From these summaries, it can be seen that over 90 per cent of zinc production in the period 1960-64, was derived from the two exhalative deposit-types: volcanic-associated and sediment-hosted. After 1965, however, production from Pine Point, a MVT deposit, decreased the percentage zinc production from exhalative deposits by about 10 per cent. The proportion from MVT deposits increased again in 1976 due to two other MVT deposits, Nanisivik and Newfoundland Zinc, coming on-stream. Zinc production from vein and replacement deposits, in the meantime, decreased proportionally from nearly 10 per cent in 1960 to less than one per cent by the late 1970s and into the 80s.

Turning to lead production (Fig. 15), it is immediately obvious that the lead production curves are considerably different than those for zinc. There are several reasons for this: (i) zinc production in Canada is dominated by the volcanic-associated exhalative type, a majority of which occur in the Precambrian and do not contain significant lead; (ii) the 1976 bulge in MVT zinc production is not mirrored in lead production because the two MVT deposits which came on stream about that time produce little or no lead, both deposits having very high Zn/(Zn + Pb) ratios; (iii) vein and replacement type deposits, in general, possess low Zn/(Zn + Pb) ratios and hence contribute proportionately more to lead production than they do to zinc.

Contact metasomatic deposits did not account for any lead or zinc production during the period in question. In fact, the author could find no record of lead or zinc production from this deposit-type at any time in Canada's mining history. This complete lack of exploitation of contact metasomatic lead-zinc deposits is somewhat anomalous when the size and geological diversity of the country is considered.

### *Percentage distribution by deposit-type*

The 378 deposits are distributed by type as shown in Table 3.

Note that vein and replacement deposits, although accounting for only a miniscule proportion of current Canadian lead and zinc production (Fig. 14, 15) make up more than a third of the known lead-zinc deposits in the country. Conversely, the supracrustal group of deposits (volcanic-associated and sediment-hosted exhalative) contribute about 70 per cent of the lead production and 80 per cent of the zinc production (Fig. 15, 14) although together they constitute only about 56% of Canadian lead-zinc deposits. Table 3 also shows that just over 93 per cent of Canada's lead-zinc deposits can be classified into one of three deposit-types namely, sediment-hosted exhalative, volcanic-associated exhalative and vein/replacement.

### *Ore tonnage distribution by deposit-type*

Although the 378 lead-zinc deposits as a group constitute a single population in terms of either tonnes ore or tonnes contained metal (Fig. 11), the deposits are not uniformly distributed by deposit-type in each size category. All deposits below 10 000 tonnes ore, for example, are of the vein and replacement type and all deposits greater than 100 000 000 tonnes are of the exhalative type. Between these two extremes, deposits are distributed by size and type as shown in Table 4 and illustrated in Figure 16. Deposits less than one million ($10^6$) tonnes in size are predominantly vein/replacement type. Deposits larger than this are predominantly of the exhalative type.

The distribution of deposit sizes for each deposit-type can be examined and compared by calculating selected percentile values for each (Table 5) and by displaying the

**Table 5.** Tonnes ore per deposit-type for selected percentile values (not shown are sandstone-lead and contact metasomatic deposit-types because of the small population of each of these types)

| Deposit-type / Percentile | n | Tonnes ore 5% | 25% | 50% | 75% | 95% |
|---|---|---|---|---|---|---|
| MVT | 16 | 93 536 | 684 467 | 3 161 411 | 6 741 431 | 35 970 415 |
| Sediment-hosted exhalative | 33 | 17 962 | 412 767 | 2 812 258 | 8 527 492 | 99 921 004 |
| Volcanic-associated exhalative | 180 | 124 284 | 397 118 | 1 432 891 | 4 001 238 | 25 502 591 |
| Vein/replacement | 140 | 3 329 | 16 284 | 63 412 | 229 630 | 1 068 613 |
| All deposits | 378 | 7 530 | 90 945 | 454 044 | 2 731 429 | 18 279 677 |

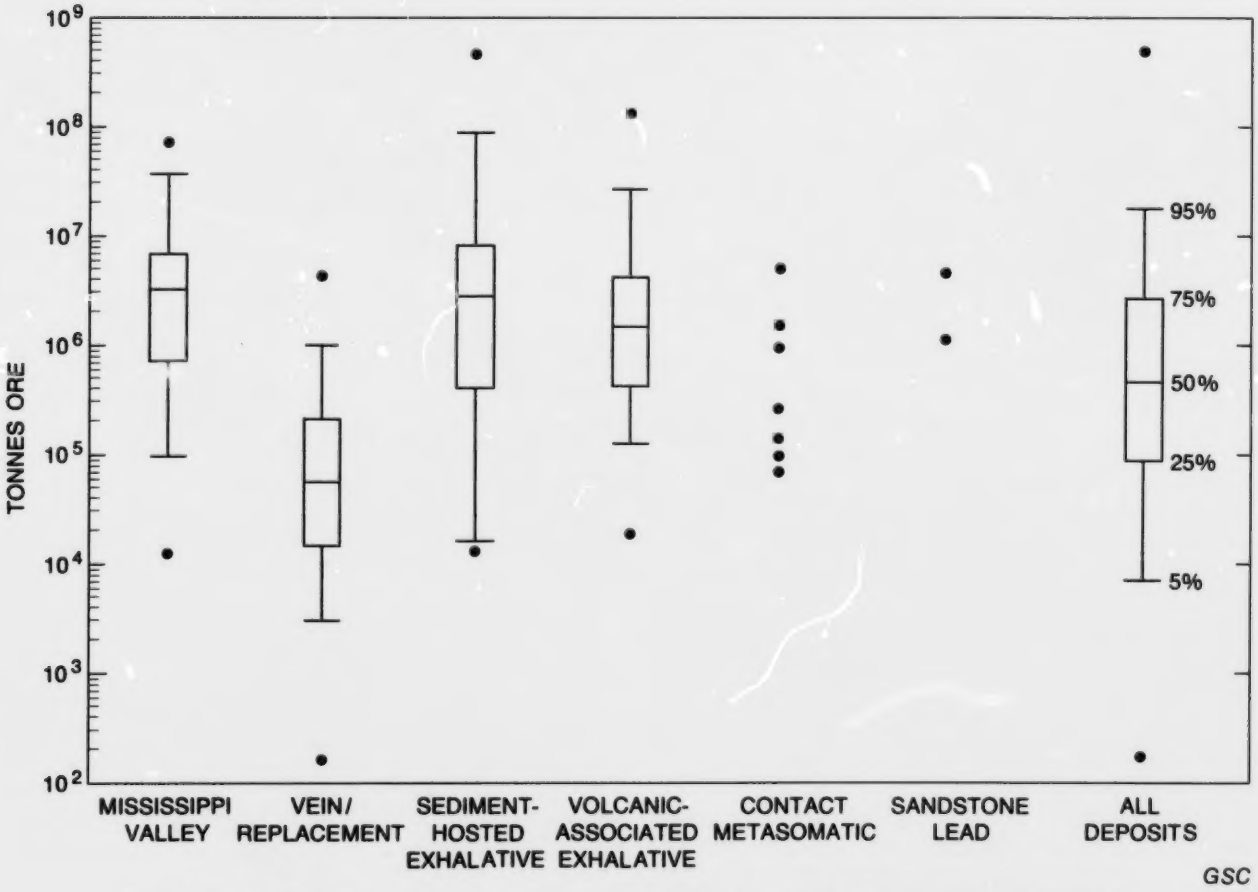


***Figure 17.*** *Box-and-whisker plots of tonnes ore in Canadian lead-zinc deposits. Largest and smallest deposits in each deposit-type are indicated by dots; selected percentile values shown by the box-and-whisker symbol in a manner described by Tukey (1977). Because of small population size, no percentile values were calculated for sandstone-lead and contact metasomatic deposits.*

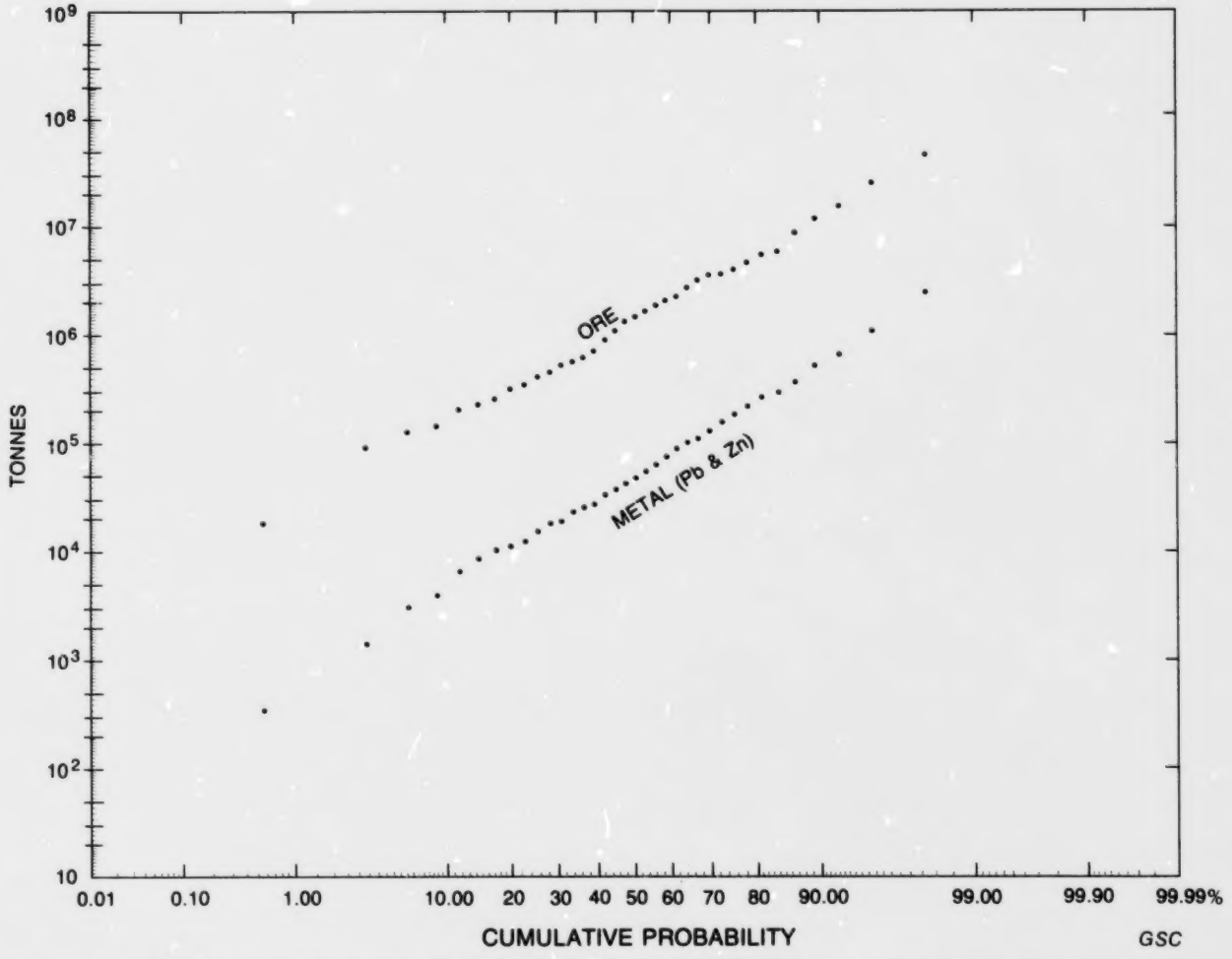


***Figure 18.*** *Probability plot of tonnes ore and contained lead-zinc in 180 Canadian volcanic-associated exhalative deposits (every 5th point plotted).*

results graphically on box-and-whisker plots (Fig. 17). By this method, the median tonnage and size range of the various deposit-types can be compared with each other and with the entire population of 378 deposits.

The data summarized in Table 5 and Figure 17 show the following: 1. all median values are skewed toward the smaller deposit-sizes; 2. vein/replacement deposits have by far the smallest median value and MVT deposits the largest. The latter type may be biased, however, because of the necessity of including a few district size data rather than those for individual deposits; 3. median size of sediment-hosted exhalative deposits is double that of the volcanic-associated exhalative deposits and the 95 percentile value of the former is nearly four times that of the volcanic-associated deposits; 4. the median size of Canadian lead-zinc deposits is about 0.5 million tonnes, obviously influenced by the vein/replacement deposits which constitute 37 per cent of the population; 5. the size range between the 5 and 95 percentile values (constituting 90 per cent of the population) for sediment-hosted exhalative deposits is slightly less than four orders of magnitude and is noticeably larger than those for other deposit-types, all of which display a range slightly more than two orders of magnitude.

Figures 18 to 21 portray the cumulative probability plots of tonnes ore and metal (Pb + Zn) in volcanic-associated exhalative, vein/replacement, sediment-hosted exhalative, and Mississippi Valley-type (MVT) deposits, respectively. In these diagrams, the following points are considered noteworthy:

1. The single populations of size distribution in volcanic-associated exhalative (Fig. 18) and vein/replacement (Fig. 19) deposits relative to sediment-hosted (Fig. 20) and MVT (Fig. 21) deposits are indicated by the straight line distribution of points in the former two diagrams. The difference is very likely due to the higher populations in the first two (n = 180 and 140, respectively) relative to the latter two deposit-types (n = 33 and 16, respectively);
2. The wider separation between the "tonnes ore" and "tonnes metal" lines of the volcanic-associated deposits (Fig. 18) relative to the vein/replacement deposits (Fig. 19) is a function of the lower average grade of the former;

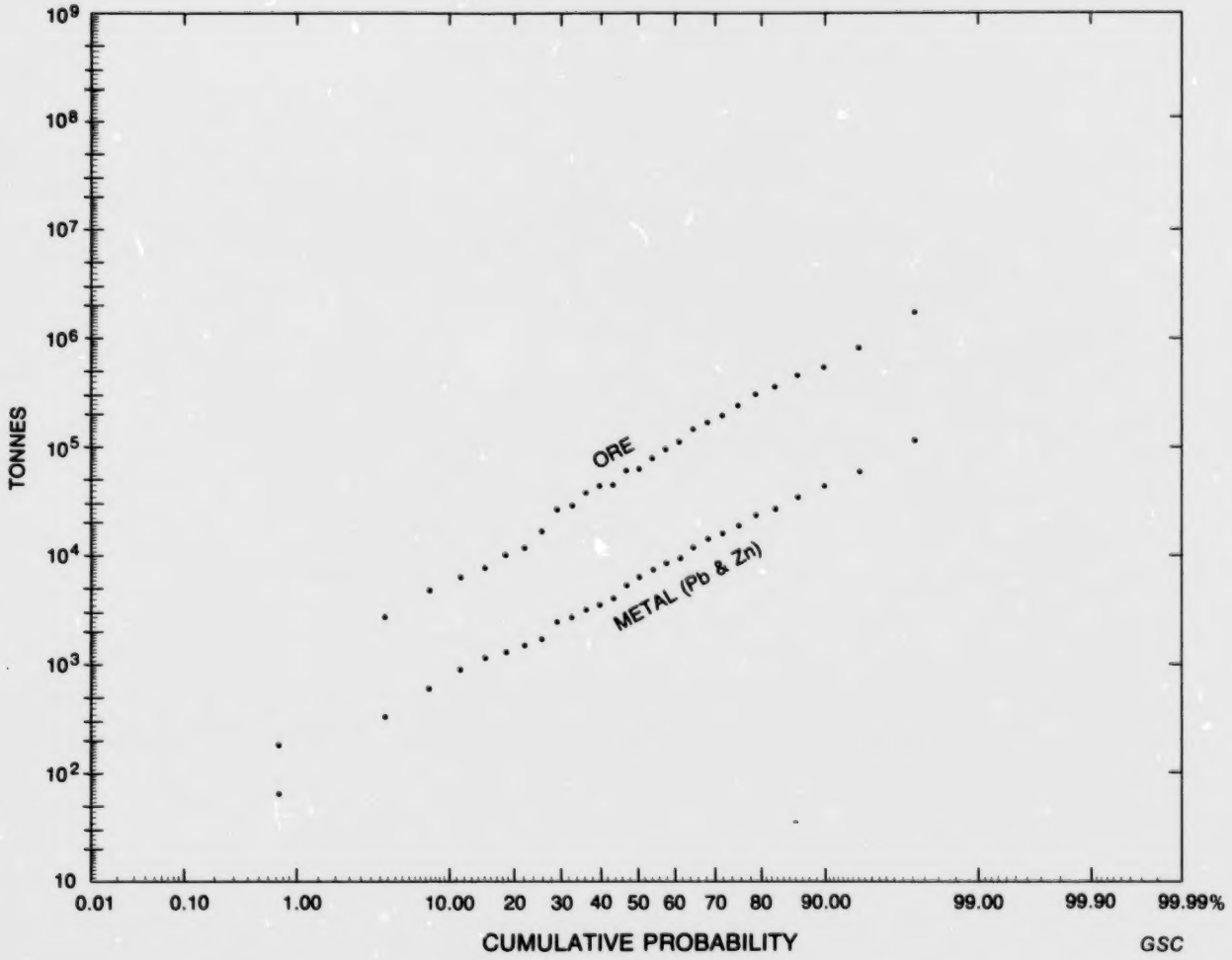


***Figure 19.*** *Probability plot of tonnes ore and contained lead-zinc in 140 Canadian vein/replacement deposits (every 5th point plotted).*

3. In the first three diagrams (Fig. 18 to 20) of large to moderate population size, the distribution of points for contained metal is smoother (i.e. closer to a straight line) than the corresponding ore curve. This suggests that tonnes of metal rather than tonnes of ore should be used when comparing deposits because of the smoother, more uniform population of the former. This technique had been previously used by the author (Sangster, 1980) in examining the sizes of volcanic-associated exhalative deposits surrounding volcanic centres.

Conclusions pertaining to deposit size, based on Tables 4 and 5 and Figures 16 and 17, should be assessed bearing in mind the manner in which tonnage-grade data are reported for some deposits. For example, Pine Point (85-002) is reported as a single grade-tonnage figure for the entire district even though this total is comprised of more than 40 individual deposits. The same applies to other MVT deposits such as Robb Lake (94-004; 12 deposits; 16 by 8 km) and Newfoundland Zinc (12-006; 10 deposits; 5 by 2 km). Another example is the Heath Steele group (21-037; 6 deposits; 4.6 by 1 km), a volcanic-associated exhalative "deposit". Howard's Pass (105-027), a sediment-hosted exhalative "deposit", consists of three individual deposits over a strike length of 20 km.

The above examples are the worst offenders of the "single deposit-single tonnage" approach. Group or district tonnages, when combined with single-deposit data, would tend to slightly bias the statistics toward high values and the reader should be aware of these problems when evaluating the statistics presented here.

***Ore grade (Pb + Zn)***

The range in ore grades (calculated as per cent combined Pb + Zn) in Canadian lead-zinc deposits is displayed in the histograms shown in Figure 22. These graphs show that a majority of the deposits grade less than 18% (Pb + Zn). The disproportionate number of vein deposits with grades higher than this value is very likely due to selective mining and/or hand-picking of ore in small mining ventures. The author suggests the "natural" population of (Pb + Zn) grades in

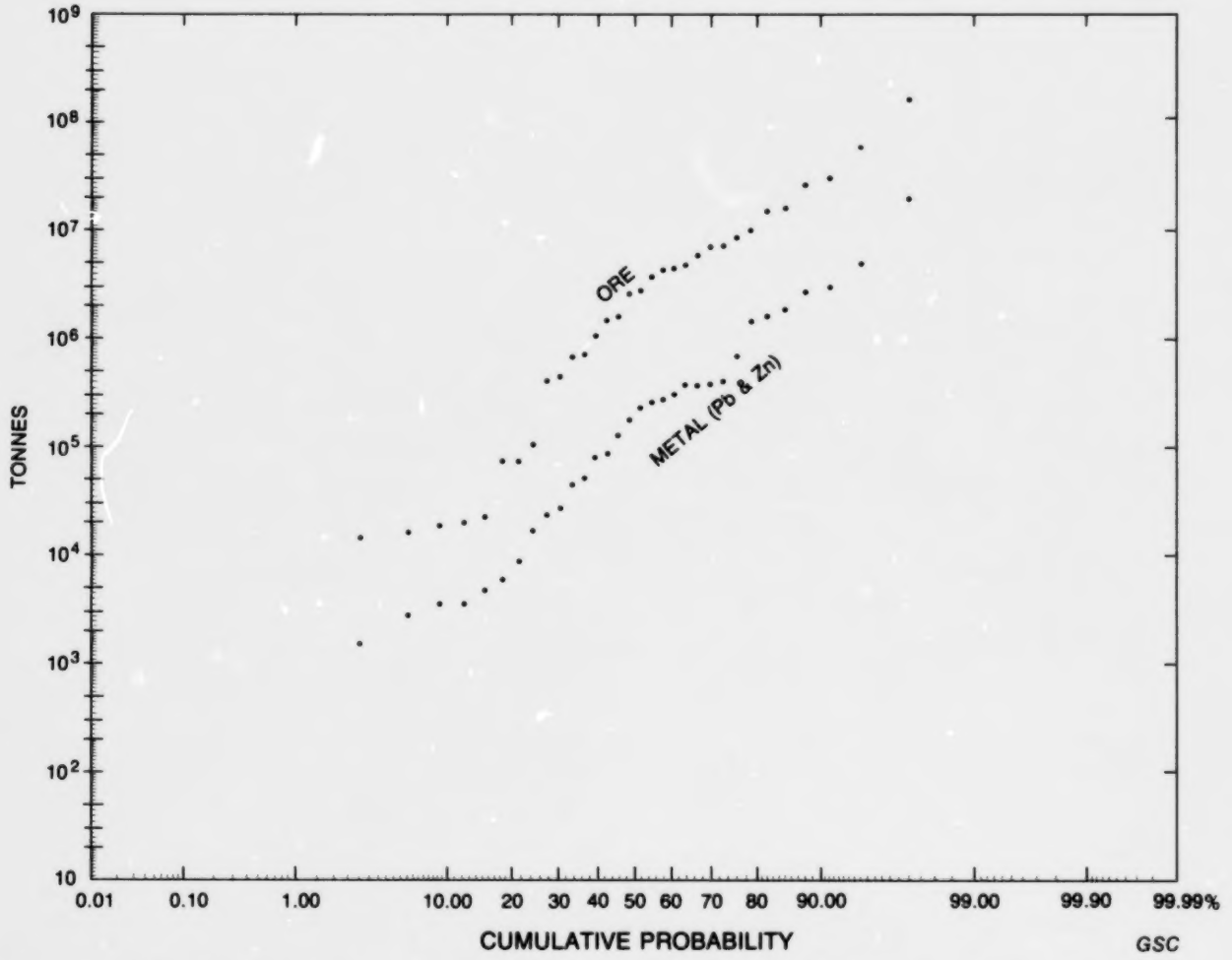


***Figure 20.*** *Probability plot of tonnes ore and contained lead-zinc in 33 Canadian sediment-hosted exhalative deposits (every point plotted).*

vein/replacement deposits to be all those less than 22% and that grades greater than this value are most likely the result of artificial factors (see Fig. 22).

The graphs in Figure 22 emphasize the narrow range of ore grades in all deposits (i.e. a little over one order of magnitude) relative to the range in ore tonnage (six orders of magnitude). The lower grade limit is probably an economic cut-off but the upper limit likely approaches a natural grade maximum. Thus the major variable determining the total metal content of a deposit is its tonnage rather than its grade. The relationship between these two parameters is shown graphically in Figure 23. Here, the constancy of grade relative to ore tonnage is apparent as is the controlling effect exerted by ore tonnage in determining metal content of deposits.

### *Metal ratio*

Histograms depicting metal ratio (Zn/(Zn + Pb)) in Canadian lead-zinc deposits are displayed in Figure 24. Several features are apparent:

1. The zinc-dominant nature of the volcanic-associated exhalative deposits. This is not only due to the inherent zinc-rich nature of this deposit-type as pointed out by Franklin et al. (1981) but the effect is further enhanced by the fact that a significant number of Canadian deposits of this type are of the Cu-Zn compositional type;
2. The extremely wide range in metal ratios of the vein/replacement deposits. Some of the variation is likely artificial because, in the early days of Canadian mining, vein deposits were selectively mined to extract the silver-bearing galena. Sphalerite was largely regarded as a gangue mineral up to and during the early part of this century;
3. The abnormally Pb-rich nature of three MVT deposits, namely Lake Monte (34-001), Silver Basin (82-152) and Silver Giant (82-071). Three possibilities could explain these anomalies: these are mis-classified vein-replacement deposits, they could be MVT deposits which were selectively mined for lead, or they could simply be unusually Pb-rich MVT deposits;

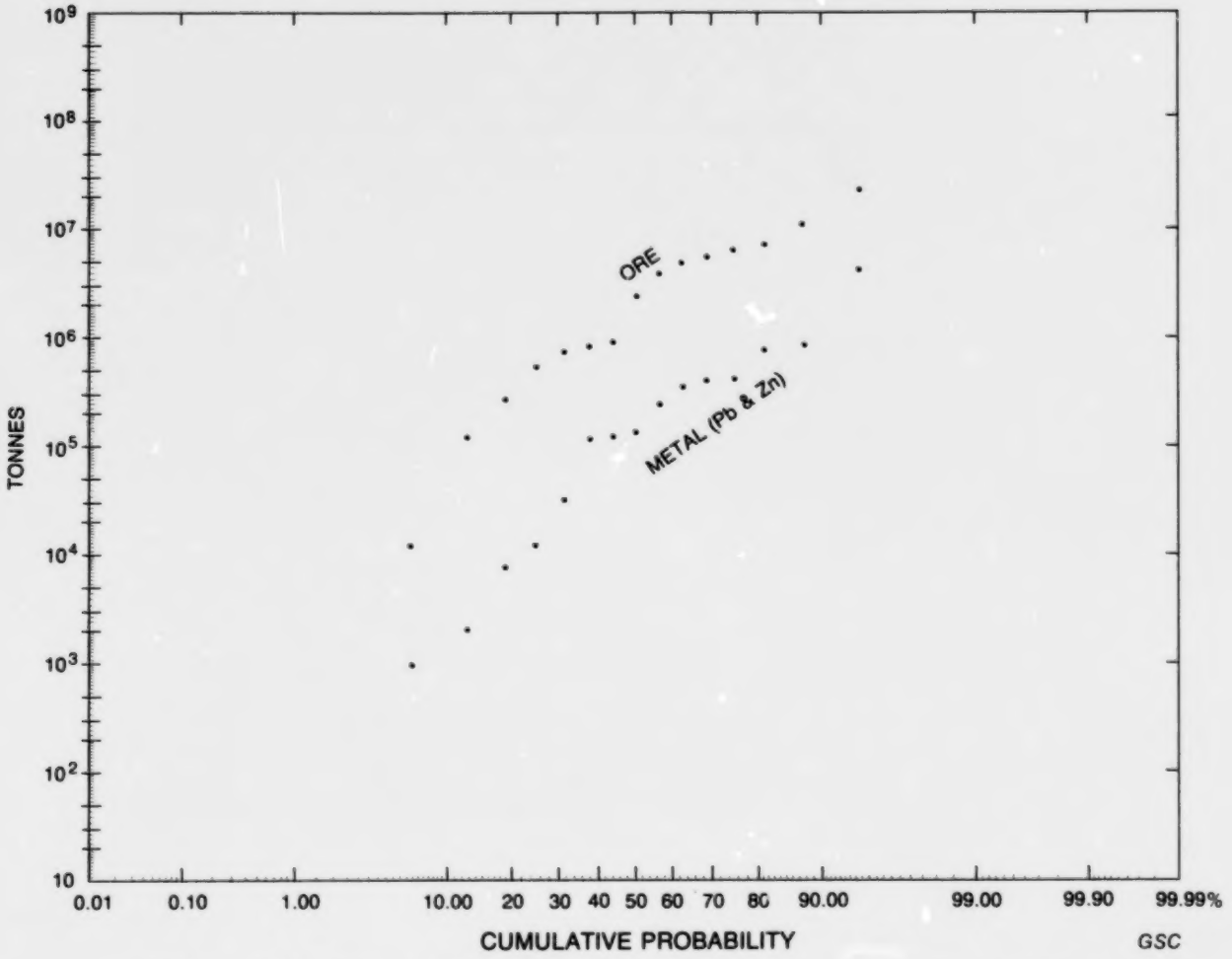


***Figure 21.*** *Probability plot of tonnes ore and contained lead-zinc in 16 Canadian Mississippi Valley-type (MVT) deposits (every point plotted).*

4. The Zn-rich nature of one of the two sandstone-lead deposits (George Lake; 4-010). This deposit, in spite of its unusual composition, is regarded as being of the sandstone-lead type because of its overwhelming geological similarity to other sandstone-lead deposits, as discussed by Bjørlykke and Sangster (1981).

## CONCLUDING REMARKS

The maps and graphs displayed in this report present a summary overview of certain quantifiable characteristics of Canadian lead-zinc deposits and occurrences. The report should be regarded as a companion summary to the popular geological, deposit-type, overviews mentioned in the text (e.g. Franklin et al., 1981; Bjørlykke and Sangster, 1981; Large, 1983).

Categorized by deposit-type, the grade-tonnage, metal content, and distribution maps may be of use and interest to mineral economists, resource planners and others, particularly when viewed in a historical context as displayed in Figures 14 and 15. Mineral exploration geologists, also, may find the grade-tonnage and metal content statistics useful in long-range planning for viable targets in remote areas of the country. Geologists engaged in genetic modelling of lead-zinc deposits should build into their models the distribution and grade-tonnage features summarized in this report; they are as much a characteristic of a particular deposit-type as are those of a geological nature.

Statistical summaries such as these are, of course, only as good as the data used. Although every effort was made to use the best production and reserve data available, these may or may not approximate the true "in-ground" situation. Among the many reasons for this are: corporate differences in the manner in which reserves data are reported and the cut-off grades used; differing metal recovery rates among mines will affect production grades reported; the problem of individual geological entities versus groups of deposits in reporting production and reserves. These complications are obviously beyond the control of the author. However, the correct classification of individual deposits or districts according to their geological characteristics is the responsibility of the author. Although the classifications reported here are the result of over 15 years of study of Canadian lead-zinc deposits, not all deposits can be easily

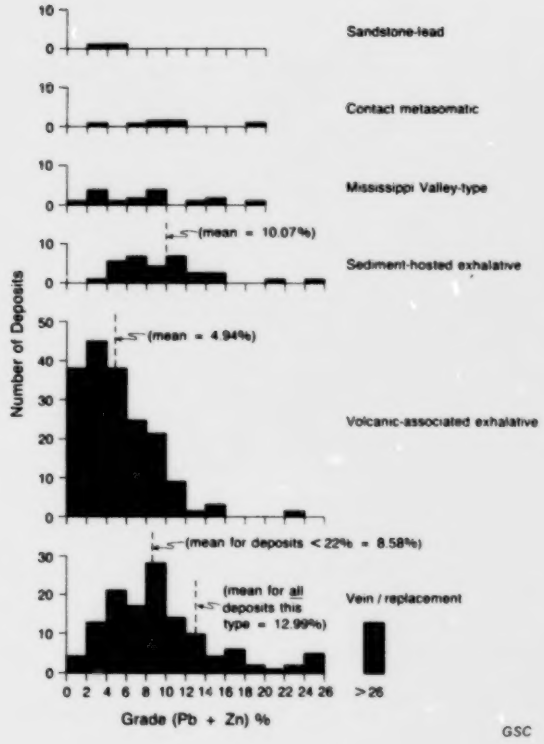


***Figure 22.*** *Frequency plots of % (Pb + Zn) in Canadian Pb-Zn deposits.*

classified due to either lack of data or conflicting geological criteria. In some instances, compromises had to be made in assigning deposits to one class or the other. Consequently, classification errors could compound the variations in statistical summaries due solely to grade-tonnage reporting problems. Nevertheless, the data summarized here are the result of several years of research and are regarded as best-available at the time of compilation (1983). Data are recorded on computer and are altered as new or better information becomes available. Future summaries such as these may be published if feasible.

## ACKNOWLEDGMENTS

A compilation of this nature obviously cannot be accomplished solely by an individual and the author is indebted to many people and institutions for assistance and guidance prior to, and during, preparation of this report.

First and foremost the author gratefully acknowledges the support and assistance of the Canadian mineral industry. For a decade and a half, mining and exploration companies operating in Canada have graciously permitted the author access to their mines and prospects to examine critical geological features. In addition their staffs have freely given of their time in guiding the author around these properties and engaging in candid and informative discussions during and after such examinations. Without assistance of this nature, the present report, particularly that part dealing with deposit classification, would not have been possible.

Within the Economic Geology and Mineralogy Division of the Geological Survey of Canada, the author is pleased to acknowledge the assistance and advice received from the following: Dave Garson, Jennifer Shaw, Robert Bretzlaff, Andy Douma, and Robert Laramée of the Mineral Resource Information Service Section; Janet Carrière of Mineral Deposits Geology Section; C.F. Chung and F.P. Agterberg of

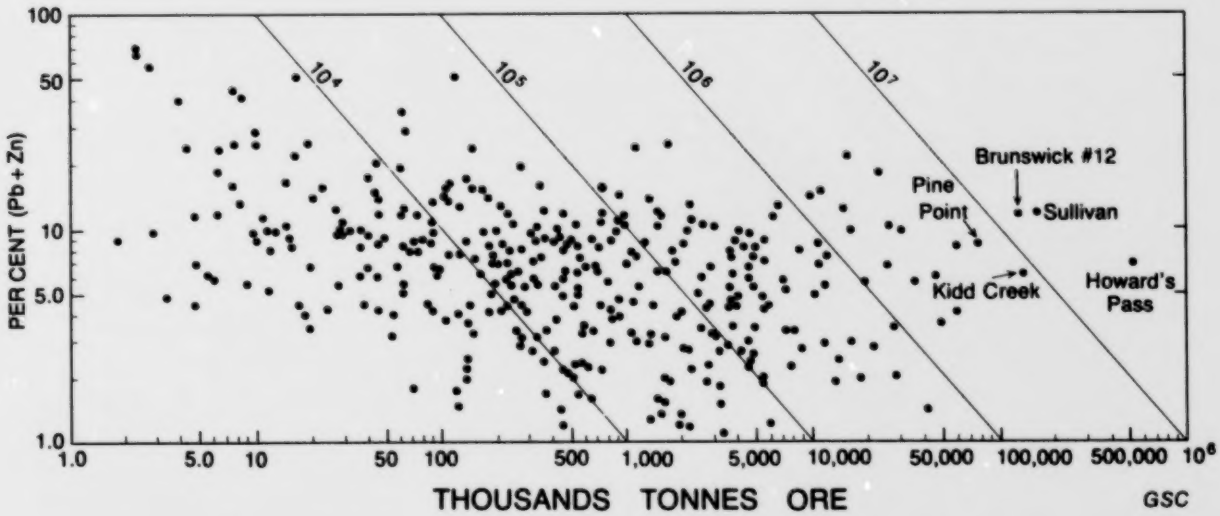


***Figure 23.*** *Scatter diagram of % (Pb + Zn) versus tonnes ore in 378 Canadian lead-zinc deposits. Diagonal lines show tonnes of contained metal (Pb + Zn) for various grade-tonnage combinations; values selected are the same as those used in size range categories in Map 1651A and Figures 2-10. Also identified are the five largest lead-zinc deposits and districts in Canada.*

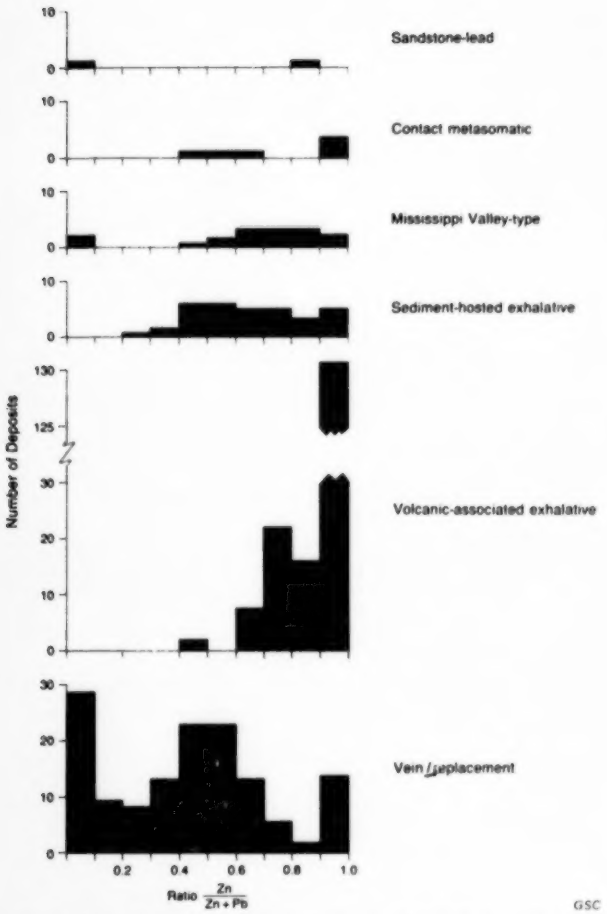


***Figure 24.*** *Frequency plots of Zn/(Zn + Pb) ratios in Canadian Pb-Zn deposits.*

the Mathematical Applications in Geology Section. These people assisted in data and bibliographic compilation, computer processing and plotting of data, map compilation, and final checking of all maps and plots.

Valuable assistance and advice was provided by J.O. Wheeler, Cordilleran Geology Division, in the compilation of Figures 8 and 9.

The manuscript received the benefit of a critical and thoughtful review by H.E. Dunsmore of the Mineral Deposits Geology Section.

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## APPENDIX A

## LISTING OF CANADIAN LEAD-ZINC DEPOSITS BY DEPOSIT-TYPE AND DEPOSIT-NUMBER

### CONTACT METASOMATIC

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 011-007 | LIME HILL | 011 F 14 | 45 46 35 | 061 09 00 |
| 011-009 | MEAT COVE | 011 N 02 | 47 00 20 | 060 35 24 |
| 092-008 | LYNN CREEK | 092 G 06 | 49 25 30 | 123 03 56 |
| 092-010 | CALEDONIA | 092 L 12 | 50 38 45 | 127 36 30 |
| 092-013 | ZIP | 092 L 07 | 50 21 50 | 126 54 40 |
| 095-006 | VIECO WHIPSAW/ RAM & ROD | 095 E 11 | 61 33 40 | 127 27 15 |
| 104-001 | MCDAME BELLE | 104 P 06 | 59 16 18 | 129 22 20 |

### MISSISSIPPI VALLEY

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 011-001 | GAY'S RIVER | 011 E 03 | 45 01 | 063 21 50 |
| 012-006 | NEWFOUNDLAND ZINC | 012 I 06 | 50 17 42 | 057 28 00 |
| 033-001 | RUBY LAKE | 033 N 15 | 55 56 42 | 076 44 |
| 033-002 | NANCY ISLAND | 033 N 15 | 55 57 30 | 076 48 |
| 034-001 | LAKE MONTE | 034 C 02 | 56 06 | 076 32 |
| 048-001 | NANISIVIK | 048 C 01 | 73 03 40 | 084 30 30 |
| 068-001 | POLARIS | 068 H 08 | 75 23 10 | 096 56 |
| 068-002 | ECLIPSE | 068 H 09 | 75 31 30 | 096 08 |
| 082-071 | GIANT / SILVER GIANT | 082 K 16 | 50 56 06 | 116 28 18 |
| 082-097 | KICKING HORSE / MONARCH | 082 N 08 | 51 25 30 | 116 26 45 |
| 082-152 | SILVER BASIN | 082 K 10 | 50 41 20 | 116 44 40 |
| 085-002 | PINE POINT DISTRICT | 085 B 15 | 60 47 00 | 114 35 00 |
| 085-009 | WESTMIN (AX GROUP) | 085 B 11 | 60 44 32 | 115 03 20 |
| 094-004 | ROBB LAKE | 094 B 13 | 56 56 30 | 123 43 40 |
| 106-003 | BEAR-TWIT | 106 A 03 | 64 02 | 129 19 |
| 106-007 | GAYNA | 106 B 15 | 64 57 | 130 43 |

### SANDSTONE LEAD

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 011-012 | YAVA (SILVERMINE) | 011 F 16 | 45 52 | 060 23 45 |
| 064-010 | GEORGE LAKE | 064 E 05 | 57 28 30 | 103 45 15 |

## APPENDIX A (CONT.)

SEDIMENT-HOSTED EXHALATIVE

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 011-003 | SMITHFIELD | 011 E 06 | 45 16 20 | 063 04 30 |
| 021-030 | WALTON | 021 H 01 | 45 12 20 | 064 02 30 |
| 031-005 | LONG LAKE | 031 C 10 | 44 41 23 | 076 46 20 |
| 031-007 | RENMAC | 031 F 07 | 45 24 45 | 076 42 20 |
| 031-030 | LEITCH | 031 J 04 | 46 06 50 | 075 57 12 |
| 031-031 | LAFONTAINE | 031 J 04 | 46 05 50 | 075 57 15 |
| 082-002 | ANNEX | 082 F 03 | 49 00 48 | 117 22 18 |
| 082-003 | REEVES MACDONALD (REMAC) | 082 F 03 | 49 01 12 | 117 22 15 |
| 082-004 | JERSEY | 082 F 03 | 49 05 55 | 117 13 15 |
| 082-005 | H.B. | 082 F 03 | 49 08 48 | 117 12 00 |
| 082-055 | SULLIVAN | 082 F 09 | 49 42 30 | 116 00 20 |
| 082-062 | DUNCAN | 082 K 07 | 50 22 12 | 116 57 00 |
| 082-065 | MINERAL KING | 082 K 08 | 50 20 45 | 116 25 35 |
| 082-066 | PARADISE | 082 K 08 | 50 28 25 | 116 18 20 |
| 082-070 | WIGWAM | 082 K 13 | 50 52 48 | 117 58 48 |
| 082-073 | RIVER JORDAN | 082 M 01 | 51 07 48 | 118 24 36 |
| 082-079 | COTTON BELT | 082 M 07 | 51 27 00 | 118 49 12 |
| 082-117 | KOOTENAY KING | 082 G 12 | 49 44 35 | 115 36 40 |
| 082-127 | MOSQUITO KING | 082 M 04 | 51 02 30 | 119 31 |
| 082-128 | COLBY | 082 L 10 | 50 43 45 | 118 44 |
| 094-002 | FERGUSON | 094 C 11 | 56 41 20 | 125 10 30 |
| 094-005 | CIRQUE | 094 F 11 | 57 31 | 125 09 |
| 095-004 | QUARTZ LAKE (MCMILLAN) | 095 D 05 | 60 29 55 | 127 56 50 |
| 095-005 | MEL GROUP | 095 D 06 | 60 21 05 | 127 24 15 |
| 105-001 | SWIM LAKE | 105 K 03 | 62 12 30 | 133 02 00 |
| 105-002 | FARO | 105 K 06 | 62 21 30 | 133 22 00 |
| 105-003 | TOM | 105 O 01 | 63 10 10 | 130 08 20 |
| 105-005 | VANGORDA | 105 K 06 | 62 15 10 | 133 11 00 |
| 105-027 | HOWARD'S PASS | 105 I 06 | 62 27 | 129 11 |
| 105-032 | GRUM | 105 K 06 | 62 16 10 | 133 13 20 |
| 105-033 | DY | 105 K 03 | 62 14 | 133 02 |
| 105-034 | JASON | 105 O 01 | 63 08 50 | 130 15 40 |
| 106-005 | GOZ | 106 C 07 | 64 25 | 132 32 |

**APPENDIX A (CONT.)**

VEIN AND REPLACEMENT

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 001-001 | SILVER CLIFF | 001 N 05 | 47 18 15 | 053 56 45 |
| 001-003 | LA MANCHE | 001 N 12 | 47 41 20 | 053 56 15 |
| 011-002 | DUNBRACK | 011 D 14 | 44 49 08 | 063 11 31 |
| 012-022 | ROUND POND | 012 P 08 | 51 16 05 | 056 15 15 |
| 021-011 | PANET | 021 L 09 | 46 35 15 | 070 13 10 |
| 021-018 | KEYMET | 021 P 13 | 47 48 00 | 065 48 38 |
| 021-019 | NIGADOO | 021 P 12 | 47 43 40 | 065 47 54 |
| 021-032 | MOUNT PLEASANT NORTH AREA | 021 G 07 | 45 26 34 | 066 49 16 |
| 021-096 | QUEBEC STURGEON - HALF MILE | 021 P 12 | 47 40 42 | 065 53 22 |
| 021-097 | QUEBEC STURGEON - SHAFT | 021 P 12 | 47 40 21 | 065 54 46 |
| 021-098 | QUEBEC STURGEON - HACHEY | 021 P 12 | 47 40 16 | 065 54 53 |
| 021-099 | QUEBEC STURGEON - PINE TREE | 021 P 12 | 47 40 46 | 065 52 55 |
| 022-007 | FEDERAL | 022 B 16 | 48 46 24 | 066 08 12 |
| 022-008 | CANDEGO | 022 G 01 | 49 03 48 | 066 04 06 |
| 022-011 | ARSENAULT LAKE | 022 A 06 | 48 22 12 | 065 13 20 |
| 031-002 | WRIGHT | 031 M 06 | 47 25 24 | 079 29 30 |
| 031-003 | KINGDON | 031 F 08 | 45 24 00 | 076 13 00 |
| 031-004 | FRONTENAC | 031 C 07 | 44 28 29 | 076 31 17 |
| 031-022 | UPTON | 031 H 10 | 45 41 | 072 40 |
| 032-024 | ODYNO / NEW NORZONE | 032 D 03 | 48 07 36 | 079 10 48 |
| 032-270 | QUEBEC CHIBOUGAMAU(MERRILL IS) | 032 G 16 | 49 52 18 | 074 19 18 |
| 041-003 | FENSOM PROSPECT/ELLA LAKE | 041 I 05 | 46 18 18 | 081 32 26 |
| 041-010 | JARDUN | 041 K 09 | 46 38 10 | 084 08 09 |
| 041-016 | DELHI PACIFIC | 041 P 01 | 47 08 40 | 080 21 40 |
| 041-022 | STACKPOOL / JEFFERSON | 041 O 16 | 47 50 04 | 082 12 16 |
| 041-023 | MATARROW | 041 P 15 | 47 54 30 | 080 44 20 |
| 042-011 | HANNAM | 042 D 15 | 48 48 24 | 086 41 28 |
| 052-003 | DORION | 052 A 15 | 48 50 05 | 088 39 32 |
| 053-003 | BERENS RIVER | 053 C 13 | 52 50 30 | 093 38 22 |
| 063-047 | HANSON LAKE | 063 L 10 | 54 40 30 | 102 51 00 |
| 075-004 | O'CONNOR LAKE | 075 E 05 | 61 19 36 | 111 47 30 |
| 082-013 | HIGHLAND BELL | 082 E 06 | 49 26 | 119 03 45 |
| 082-016 | ORE HILL | 082 F 03 | 49 07 30 | 117 08 40 |
| 082-020 | KOOTENAY FLORENCE | 082 F 15 | 49 46 | 116 55 30 |
| 082-022 | YANKEE GIRL | 082 F 06 | 49 17 23 | 117 11 10 |
| 082-028 | WHITEWATER | 082 K 03 | 50 02 57 | 117 07 58 |
| 082-031 | NORTH STAR | 082 F 09 | 49 40 53 | 116 01 30 |
| 082-032 | HIGHLANDER | 082 F 10 | 49 43 09 | 116 54 30 |
| 082-033 | MOLLY GIBSON | 082 F 11 | 49 44 12 | 117 09 00 |
| 082-034 | CORK PROVINCE | 082 F 14 | 49 54 31 | 117 04 26 |
| 082-036 | VICTOR / VIOLAMAC | 082 F 14 | 49 59 54 | 117 16 19 |
| 082-037 | MAMMOTH | 082 F 14 | 49 57 42 | 117 17 15 |
| 082-038 | RUTH-HOPE | 082 F 14 | 49 58 10 | 117 13 50 |
| 082-039 | NOBLE FIVE | 082 F 14 | 49 59 31 | 117 12 01 |
| 082-040 | GALENA FARM | 082 F 14 | 49 55 48 | 117 21 25 |
| 082-041 | VAN ROI | 082 F 14 | 49 55 50 | 117 17 13 |
| 082-043 | RICHMOND EUREKA | 082 F 14 | 49 58 01 | 117 13 04 |

VEIN AND REPLACEMENT (CONT.)

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 082-044 | SILVERSMITH | 082 F 14 | 49 58 00 | 117 13 22 |
| 082-046 | HEWITT | 082 F 14 | 49 55 35 | 117 18 00 |
| 082-047 | SURPRISE | 082 F 14 | 49 59 55 | 117 11 42 |
| 082-048 | BOSUN | 082 F 14 | 49 58 25 | 117 21 43 |
| 082-050 | STANDARD | 082 F 14 | 49 57 22 | 117 19 08 |
| 082-051 | IVANHOE | 082 F 14 | 49 57 28 | 117 14 23 |
| 082-052 | BLUEBELL | 082 F 15 | 49 45 33 | 116 51 43 |
| 082-053 | HIGHLAND | 082 F 15 | 49 45 30 | 116 56 30 |
| 082-054 | ST. EUGENE | 082 G 05 | 49 17 00 | 115 49 06 |
| 082-056 | ESTELLA | 082 G 13 | 49 46 20 | 115 37 |
| 082-059 | RAMBLER-CARIBOO | 082 K 03 | 50 00 44 | 117 11 33 |
| 082-061 | LUCKY JIM | 082 K 03 | 50 01 56 | 117 11 59 |
| 082-068 | TRUE FISSURE | 082 K 11 | 50 42 15 | 117 30 |
| 082-069 | SPIDER & ECLIPSE | 082 K 13 | 50 46 25 | 117 37 40 |
| 082-074 | MASTODON | 082 M 01 | 51 14 07 | 118 07 05 |
| 082-087 | SNOWFLAKE / STANN TR | 082 N 04 | 51 11 45 | 117 44 00 |
| 082-089 | IDAHO-ALAMO | 082 F 14 | 49 59 08 | 117 18 15 |
| 082-104 | PAYNE | 082 K 03 | 50 00 25 | 117 13 49 |
| 082-105 | WONDERFUL | 082 F 14 | 49 58 50 | 117 14 50 |
| 082-106 | CARNATION | 082 F 14 | 49 58 06 | 117 16 25 |
| 082-107 | RUTH VERMONT | 082 K 15 | 50 56 55 | 116 58 55 |
| 082-108 | ALTOONA GROUP | 082 F 14 | 49 59 34 | 117 14 40 |
| 082-109 | MONTEZUMA GROUP | 082 F 14 | 49 56 20 | 117 03 20 |
| 082-110 | SCRANTON | 082 F 14 | 49 47 15 | 117 03 35 |
| 082-111 | UTICA | 082 F 14 | 49 58 35 | 117 07 35 |
| 082-113 | TEDDY GLACIER | 082 K 13 | 50 51 45 | 117 45 10 |
| 082-118 | JACKSON | 082 K 03 | 50 00 14 | 117 09 42 |
| 082-119 | WASHINGTON | 082 K 03 | 50 00 18 | 117 13 04 |
| 082-120 | NETTIE LAKE | 082 K 11 | 50 41 17 | 117 26 55 |
| 082-121 | SILVER CUP | 082 K 11 | 50 38 10 | 117 23 10 |
| 082-123 | HAWK CREEK / ALBION | 082 N 01 | 51 06 10 | 116 02 40 |
| 082-126 | ANTOINE SILVER | 082 K 03 | 50 00 09 | 117 11 53 |
| 082-129 | BELL | 082 F 14 | 49 59 28 | 117 09 45 |
| 082-130 | SUNSET | 082 F 14 | 49 59 20 | 117 09 56 |
| 082-131 | VIGILANT | 082 F 15 | 49 47 | 116 56 |
| 082-132 | RECO (1,2,3,4) | 082 F 14 | 49 59 35 | 117 11 18 |
| 082-133 | NAMELESS & AUGUST FRACTIONS | 082 F 15 | 49 47 | 116 55 |
| 082-135 | LUCKY THOUGHT | 082 F 14 | 49 56 20 | 117 18 05 |
| 082-136 | QUEEN BESS | 082 F 14 | 49 59 28 | 117 16 45 |
| 082-137 | ENTERPRISE | 082 F 14 | 49 49 12 | 117 19 35 |
| 082-138 | AMERICAN BOY | 082 F 14 | 49 59 24 | 117 12 18 |
| 082-139 | LAST CHANCE | 082 F 14 | 49 59 40 | 117 12 08 |
| 082-140 | SPOKANE | 082 F 10 | 49 44 08 | 116 55 06 |
| 082-143 | BANKER | 082 F 10 | 49 43 42 | 116 54 52 |
| 082-144 | ARLINGTON | 082 F 14 | 49 47 30 | 117 21 38 |
| 082-145 | WELLINGTON-BOUNTY | 082 E 06 | 49 26 | 119 06 30 |
| 082-146 | GOODENOUGH | 082 F 06 | 49 19 12 | 117 11 00 |

VEIN AND REPLACEMENT (CONT.)

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 082-147 | ADAMS PLATEAU / LUCKY COON | 082 M 04 | 51 04 00 | 119 37 10 |
| 082-148 | KEYSTONE | 082 K 03 | 50 03 15 | 117 07 54 |
| 082-149 | BROADVIEW | 082 K 11 | 50 41 50 | 117 29 30 |
| 082-150 | CALEDONIA | 082 K 03 | 50 01 40 | 117 06 02 |
| 082-151 | SILMONAC | 082 F 14 | 49 58 | 117 14 45 |
| 092-004 | PLANET / STUMP | 092 I 08 | 50 20 | 120 23 30 |
| 092-005 | SUNSHINE | 092 I 07 | 50 18 42 | 120 45 42 |
| 092-006 | BRANDYWINE-NORTHAIR | 092 J 03 | 50 07 30 | 123 06 |
| 092-012 | PILGRIM, CATHERINE | 092 L 06 | 50 26 07 | 127 24 00 |
| 093-001 | EMERALD-GLACIER | 093 E 11 | 53 44 20 | 127 15 45 |
| 093-002 | CRONIN-BABINE | 093 L 15 | 54 55 00 | 126 48 20 |
| 093-003 | SILVER STANDARD | 093 M 05 | 55 19 02 | 127 37 35 |
| 093-004 | BRADINA | 093 L 02 | 54 07 20 | 126 43 00 |
| 093-005 | DUTHIE | 093 L 14 | 54 46 23 | 127 21 20 |
| 093-006 | COPPER CROWN | 093 L 10 | 54 33 30 | 126 43 45 |
| 093-008 | LUSTDUST | 093 N 11 | 55 33 30 | 125 25 |
| 093-009 | SILVER CUP | 093 M 05 | 55 21 09 | 127 30 45 |
| 095-003 | PRAIRIE CREEK | 095 F 10 | 61 33 35 | 124 47 30 |
| 103-003 | NORTH STAR | 103 P 12 | 55 41 10 | 129 30 50 |
| 103-004 | DUNWELL | 103 P 13 | 55 59 45 | 129 55 25 |
| 103-007 | PROSPERITY | 103 P 13 | 55 54 12 | 129 56 00 |
| 103-009 | PORTLAND CANAL | 103 P 13 | 55 58 21 | 129 54 50 |
| 103-010 | PORTER IDAHO | 103 P 13 | 55 54 02 | 129 55 46 |
| 104-007 | BIG CANYON | 104 N 12 | 59 44 10 | 133 31 |
| 104-008 | SILVER QUEEN/MAGNO/MARBLE CK | 104 P 05 | 59 15 30 | 129 49 35 |
| 104-009 | INDIAN | 104 B 01 | 56 04 45 | 130 02 |
| 105-006 | KENO HILL | 105 M 14 | 63 55 45 | 135 14 30 |
| 105-008 | LUCKY QUEEN | 105 M 14 | 63 57 11 | 135 15 00 |
| 105-011 | BARB - MATT BERRY | 105 H 06 | 61 28 00 | 129 25 00 |
| 105-012 | VENUS | 105 D 02 | 60 01 13 | 134 37 45 |
| 105-013 | STUMP | 105 F 09 | 61 31 30 | 132 11 00 |
| 105-014 | HECTOR-CALUMET | 105 M 14 | 63 55 06 | 135 23 36 |
| 105-015 | HUSKY | 105 M 13 | 63 54 35 | 135 30 35 |
| 105-016 | ONEK | 105 M 14 | 63 54 47 | 135 17 22 |
| 105-017 | GALKENO | 105 M 14 | 63 55 42 | 135 21 30 |
| 105-018 | COMSTOCK KENO | 105 M 14 | 63 56 23 | 135 12 15 |
| 105-019 | SILVER KING | 105 M 13 | 63 53 48 | 135 34 03 |
| 105-020 | NO CASH | 105 M 14 | 63 55 17 | 135 25 54 |
| 105-021 | ELSA | 105 M 14 | 63 54 37 | 135 28 42 |
| 105-022 | WHIPSAW-EUREKA | 105 M 14 | 63 54 25 | 135 15 35 |
| 105-023 | SADIE-LADUE | 105 M 14 | 63 57 07 | 135 16 54 |
| 105-024 | FORMO | 105 M 14 | 63 56 41 | 135 21 57 |
| 105-025 | DIXIE | 105 M 14 | 63 54 48 | 135 27 51 |
| 105-026 | TOWNSITE | 105 M 14 | 63 54 50 | 135 24 30 |
| 106-002 | PESO-REX | 106 D 04 | 64 00 45 | 135 57 20 |
| 106-006 | CLARK | 106 D 02 | 64 07 22 | 134 57 06 |

VOLCANIC-ASSOCIATED EXHALATIVE

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 002-023 | POINT LEAMINGTON | 002 E 05 | 49 17 15 | 055 35 35 |
| 011-006 | STIRLING | 011 F 09 | 45 43 40 | 060 26 15 |
| 012-008 | CONSOLIDATED RAMBLER MAIN | 012 H 16 | 49 53 33 | 056 05 00 |
| 012-009 | BUCHANS | 012 A 15 | 48 49 20 | 056 51 52 |
| 012-010 | YORK HARBOUR | 012 G 01 | 49 02 53 | 058 18 28 |
| 012-021 | TULK'S POND | 012 A 11 | 48 30 54 | 057 12 12 |
| 021-002 | CLINTON COPPER | 021 E 07 | 45 27 36 | 070 54 30 |
| 021-004 | WEEDON | 021 E 11 | 45 42 15 | 071 22 23 |
| 021-005 | SUFFIELD | 021 E 05 | 45 19 09 | 071 57 35 |
| 021-007 | MOULTON HILL | 021 E 05 | 45 25 35 | 071 48 48 |
| 021-009 | CUPRA-D'ESTRIE | 021 E 14 | 45 46 20 | 071 18 40 |
| 021-010 | SOLBEC | 021 E 14 | 45 49 00 | 071 18 30 |
| 021-014 | MURRAY BROOK | 021 O 09 | 47 31 06 | 066 25 54 |
| 021-015 | RESTIGOUCHE/THIRD PORTAGE LAKE | 021 O 10 | 47 30 12 | 066 33 42 |
| 021-016 | CARIBOU | 021 O 09 | 47 33 43 | 066 17 48 |
| 021-017 | ORVAN BROOK | 021 O 09 | 47 37 42 | 066 08 11 |
| 021-022 | HALF MILE LAKE (T.G.S.) | 021 O 08 | 47 18 23 | 066 19 32 |
| 021-023 | ROCKY TURN | 021 O 09 | 47 37 59 | 066 04 18 |
| 021-024 | KEY ANACON /MIDDLE LANDING | 021 P 05 | 47 26 12 | 065 42 00 |
| 021-026 | CHESTER | 021 O 01 | 47 05 58 | 066 13 48 |
| 021-028 | TEAHAN | 021 H 10 | 45 43 | 064 59 30 |
| 021-035 | BRUNSWICK #6 | 021 P 05 | 47 24 20 | 065 49 17 |
| 021-036 | BRUNSWICK #12 | 021 P 05 | 47 28 28 | 065 53 24 |
| 021-037 | HEATH STEELE GROUP | 021 O 08 | 47 17 28 | 066 04 55 |
| 021-038 | AUSTIN BROOK | 021 P 05 | 47 23 52 | 065 49 24 |
| 021-041 | LINGWICK | 021 E 11 | 45 39 18 | 071 23 |
| 021-045 | NEPISGUIT | 021 O 08 | 47 22 26 | 066 02 10 |
| 021-047 | STRATMAT MAIN | 021 O 08 | 47 19 13 | 066 06 45 |
| 021-048 | STRATMAT WEST | 021 O 08 | 47 18 31 | 066 08 03 |
| 021-049 | CANOE LANDING | 021 O 08 | 47 24 38 | 066 06 16 |
| 021-050 | WEDGE | 021 O 08 | 47 23 40 | 066 07 58 |
| 021-051 | HALF MILE LAKE (KEEVIL) | 021 O 08 | 47 19 20 | 066 18 07 |
| 021-053 | HALF MILE LAKE(CONWEST) | 021 O 08 | 47 18 57 | 066 18 39 |
| 021-054 | ARMSTRONG ZONE A-SOUTH LENS | 021 O 09 | 47 36 05 | 066 02 31 |
| 021-085 | NINEMILE BROOK | 021 P 05 | 47 23 29 | 065 55 50 |
| 021-091 | PABINEAU RIVER | 021 P 05 | 47 26 48 | 065 54 38 |
| 021-100 | STRATMAT-CENTRAL | 021 O 08 | 47 19 11 | 066 06 25 |
| 021-101 | HEATH STEELE BOUNDARY ZONE | 021 O 08 | 47 18 24 | 066 07 48 |
| 024-001 | SOUCY NO 1 | 024 K 05 | 58 19 19 | 069 52 06 |
| 024-002 | PRUDHOMME NO 1 | 024 K 05 | 58 15 36 | 069 54 18 |
| 031-009 | TETREAULT | 031 I 16 | 46 49 30 | 072 20 54 |
| 031-020 | UNITED MONTAUBAN | 031 I 16 | 46 50 24 | 072 20 42 |
| 031-027 | CALUMET | 031 F 10 | 45 42 00 | 076 40 48 |
| 031-029 | PENN-COBALT (FOSTER) | 031 M 05 | 47 22 20 | 079 39 55 |
| 032-010 | MANITOU BARVUE | 032 C 04 | 48 05 12 | 077 36 36 |
| 032-012 | VENDOME | 032 C 05 | 48 25 24 | 077 39 42 |
| 032-013 | BARVALLEE | 032 C 05 | 48 25 42 | 077 40 50 |

**APPENDIX A (CONT.)**

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 032-014 | BELFORT ROYMONT | 032 C 05 | 48 25 47 | 077 40 54 |
| 032-018 | CONSOLIDATED PERSHCOURT | 032 C 12 | 48 31 24 | 077 41 06 |
| 032-019 | MONPAS (ALBARMONT) | 032 C 12 | 48 36 54 | 077 52 12 |
| 032-020 | ABITIBI SILVER / FREBERT | 032 C 12 | 48 31 42 | 077 41 54 |
| 032-021 | NORTH TRINITY | 032 C 12 | 48 42 30 | 077 45 36 |
| 032-022 | BARVUE | 032 C 12 | 48 31 18 | 077 40 30 |
| 032-023 | LYNX (OBASKA) | 032 F 12 | 49 38 48 | 077 43 18 |
| 032-026 | NORBEC | 032 D 06 | 48 21 12 | 079 03 18 |
| 032-027 | OLD WAITE | 032 D 06 | 48 20 20 | 079 05 12 |
| 032-028 | LAKE DUFAULT NO 2 | 032 D 06 | 48 18 12 | 079 03 48 |
| 032-029 | VAUZE | 032 D 06 | 48 21 48 | 079 04 42 |
| 032-030 | EAST WAITE | 032 D 06 | 48 20 36 | 079 04 42 |
| 032-031 | MINES GALLEN (WEST MACDONALD) | 032 D 07 | 48 19 36 | 078 57 12 |
| 032-032 | QUEMONT | 032 D 06 | 48 15 30 | 079 00 24 |
| 032-033 | AMULET F | 032 D 06 | 48 19 00 | 079 04 42 |
| 032-034 | AMULET A | 032 D 06 | 48 18 15 | 079 04 00 |
| 032-035 | DELBRIDGE | 032 D 07 | 48 15 54 | 078 57 48 |
| 032-036 | MOBRUN | 032 D 07 | 48 23 24 | 078 54 00 |
| 032-039 | NORMETAL | 032 D 14 | 49 00 | 079 22 |
| 032-040 | KELLY DESMOND | 032 E 08 | 49 26 06 | 078 19 52 |
| 032-041 | POIRIER | 032 E 08 | 49 26 43 | 078 23 03 |
| 032-042 | JOUTEL COPPER | 032 E 08 | 49 28 | 078 23 |
| 032-046 | EMPIRE OIL LETAC | 032 F 08 | 49 26 48 | 076 09 30 |
| 032-048 | CONIAGAS | 032 F 08 | 49 29 54 | 076 09 48 |
| 032-052 | MATTAGAMI LAKE | 032 F 12 | 49 43 00 | 077 43 00 |
| 032-053 | BELL ALLARD SOUTH GROUP | 032 F 12 | 49 41 18 | 077 41 54 |
| 032-055 | ORCHAN | 032 F 12 | 49 42 30 | 077 42 30 |
| 032-056 | NORITA (RADIORE A) | 032 F 13 | 49 46 00 | 077 39 18 |
| 032-057 | RADIORE EAST | 032 F 13 | 49 45 06 | 077 33 36 |
| 032-058 | BELL CHANNEL | 032 F 13 | 49 46 12 | 077 37 30 |
| 032-059 | GARON LAKE | 032 F 13 | 49 46 10 | 077 34 04 |
| 032-060 | NEW HOSCO | 032 F 13 | 49 47 24 | 077 50 06 |
| 032-063 | ANTOINETTE LAKE GROUP TACHE LK | 032 G 16 | 49 56 30 | 074 24 20 |
| 032-070 | MILLENBACH | 032 D 06 | 48 18 04 | 079 03 15 |
| 032-243 | SOMA ALTA | 032 F 08 | 49 25 31 | 076 08 12 |
| 032-257 | LOUVEM | 032 C 04 | 48 05 54 | 077 31 12 |
| 032-258 | LEMOINE TWP. | 032 G 16 | 49 45 44 | 074 06 10 |
| 032-259 | LA GAUCHETIERE | 032 E 16 | 49 46 29 | 078 09 19 |
| 032-260 | MAGUSI RIVER | 032 D 06 | 48 26 27 | 079 22 21 |
| 032-261 | LESSARD OPTION | 032 J 10 | 50 38 30 | 074 38 30 |
| 032-262 | LES MINES SELBAIE(A-1,B ZONES) | 032 E 15 | 49 47 | 078 55 |
| 032-263 | AMULET C | 032 D 06 | 48 18 20 | 079 04 15 |
| 032-264 | NEWCONEX FIGUERY | 032 D 08 | 48 28 45 | 078 10 15 |
| 032-265 | CORBET | 032 D 06 | 48 18 00 | 079 04 54 |
| 032-266 | SCOTT TWP (SELCO) | 032 G 15 | 49 51 52 | 074 37 47 |
| 032-267 | D-266 (LD-75) | 032 D 06 | 48 18 14 | 079 03 39 |
| 032-268 | LA RIBOURDE-SAUSSURE | 032 G 13 | 49 48 30 | 075 32 |

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 032-269 | TONNANCOURT-3 | 032 C 15 | 48 51 48 | 076 59 00 |
| 032-271 | CONIGO - WEST CU-ZN-AG ZONE | 032 D 09 | 48 35 49 | 078 03 30 |
| 032-272 | CONIGO - WEST UPPER AG-ZN ZONE | 032 D 09 | 48 35 49 | 078 03 28 |
| 041-004 | ERRINGTON | 041 I 11 | 46 32 00 | 081 16 28 |
| 041-007 | STRALAK | 041 I 13 | 46 48 09 | 081 41 50 |
| 041-008 | LAKE GENEVA | 041 I 13 | 46 47 24 | 081 30 55 |
| 041-019 | SHUNSBY | 041 O 10 | 47 42 48 | 082 39 30 |
| 041-024 | VERMILION LAKE | 041 I 11 | 46 31 00 | 081 21 00 |
| 042-002 | KIDD CREEK | 042 A 11 | 48 41 30 | 081 21 55 |
| 042-003 | CANADIAN JAMIESON | 042 A 12 | 48 32 06 | 081 34 06 |
| 042-004 | JAMELAND | 042 A 12 | 48 35 00 | 081 35 00 |
| 042-005 | KAM KOTIA | 042 A 12 | 48 35 36 | 081 37 00 |
| 042-006 | ZENMAC | 042 D 14 | 48 58 50 | 087 21 30 |
| 042-012 | WILLECHO | 042 F 04 | 49 10 30 | 085 52 48 |
| 042-013 | BIG NAMA CREEK | 042 F 04 | 49 09 51 | 085 50 46 |
| 042-014 | WILLROY | 042 F 04 | 49 09 27 | 085 49 28 |
| 042-015 | GECO | 042 F 04 | 49 09 15 | 085 47 40 |
| 042-017 | HEADVUE | 042 L 04 | 50 01 14 | 087 39 38 |
| 042-018 | KENDON | 042 L 05 | 50 25 30 | 087 36 40 |
| 042-022 | POTTER (MUNRO) | 042 A 09 | 48 36 00 | 080 12 40 |
| 042-023 | MARSHALL LAKE | 042 L 05 | 50 25 25 | 087 35 20 |
| 052-006 | MATTABI | 052 G 15 | 49 52 36 | 090 58 06 |
| 052-007 | TROUT BAY | 052 M 01 | 51 00 32 | 094 12 |
| 052-008 | SOUTH BAY | 052 N 02 | 51 06 35 | 092 40 45 |
| 052-015 | STURGEON LAKE | 052 G 15 | 49 52 35 | 090 52 53 |
| 052-016 | LYON LAKE | 052 G 15 | 49 53 06 | 090 53 30 |
| 052-017 | COPPER LODE-E ZONE | 052 K 15 | 50 58 00 | 092 52 40 |
| 052-020 | CREEK ZONE | 052 G 15 | 49 52 54 | 090 53 07 |
| 063-004 | COPPER-MAN | 063 J 12 | 54 39 00 | 099 52 30 |
| 063-005 | ROD(STALL) LAKE | 063 J 13 | 54 51 36 | 099 54 12 |
| 063-007 | OSBORNE LAKE | 063 J 13 | 54 57 15 | 099 43 24 |
| 063-008 | WILDNEST | 063 M 01 | 55 03 35 | 102 14 50 |
| 063-011 | SPRUCE POINT | 063 K 09 | 54 34 30 | 100 24 00 |
| 063-012 | CUPRUS | 063 K 12 | 54 43 12 | 101 42 48 |
| 063-013 | CENTENNIAL | 063 K 12 | 54 42 03 | 101 39 59 |
| 063-014 | MANDY | 063 K 12 | 54 43 40 | 101 49 56 |
| 063-015 | SCHIST LAKE | 063 K 12 | 54 43 10 | 101 49 35 |
| 063-016 | WHITE LAKE | 063 K 12 | 54 42 50 | 101 43 40 |
| 063-021 | FLIN FLON | 063 K 13 | 54 45 39 | 101 52 42 |
| 063-029 | VAMP LAKE | 063 K 14 | 54 56 13 | 101 10 20 |
| 063-032 | RAIL LAKE | 063 K 10 | 54 44 30 | 100 35 25 |
| 063-033 | CHISEL LAKE | 063 K 16 | 54 49 48 | 100 06 45 |
| 063-034 | GHOST LAKE | 063 K 16 | 54 49 18 | 100 04 48 |
| 063-035 | DICKSTONE | 063 K 16 | 54 51 12 | 100 29 50 |
| 063-036 | POT LAKE | 063 K 16 | 54 45 17 | 100 09 00 |
| 063-037 | BOMBER | 063 K 16 | 54 51 50 | 100 10 45 |
| 063-039 | JUNGLE | 063 N 02 | 55 10 | 100 58 |

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEP NUM | DEPOSIT NAME | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| 063-041 | BOB LAKE | 063 N 03 | 55 09 30 | 101 02 45 |
| 063-042 | SHERRIDON | 063 N 03 | 55 08 22 | 101 06 25 |
| 063-044 | RAMSAY | 063 L 10 | 54 44 20 | 102 45 30 |
| 063-045 | SCHOTTS LAKE | 063 M 01 | 55 05 45 | 102 13 35 |
| 063-049 | LOST LAKE | 063 K 16 | 54 49 | 100 05 |
| 063-051 | DYCE SIDING (SYLVIA ZONE) | 063 K 08 | 54 24 25 | 100 08 57 |
| 063-052 | WESTARM | 063 K 12 | 54 38 30 | 101 50 12 |
| 063-053 | ANDERSON | 063 J 13 | 54 51 35 | 099 59 35 |
| 063-054 | STALL | 063 J 13 | 54 51 20 | 099 56 30 |
| 063-055 | EMBURY (TROUT) LAKE | 063 K 13 | 54 49 45 | 101 49 30 |
| 063-056 | COPPER REEF | 063 K 12 | 54 36 45 | 101 36 24 |
| 064-002 | RUTTAN | 064 B 05 | 56 28 36 | 099 38 06 |
| 064-003 | KNOBBY LAKE (SAND 4) | 064 B 13 | 56 53 30 | 099 54 |
| 064-006 | FOX LAKE | 064 C 12 | 56 38 05 | 101 37 50 |
| 064-007 | DH-FL GROUP | 064 C 14 | 56 50 00 | 101 00 30 |
| 064-011 | PEG | 064 D 04 | 56 07 20 | 103 42 00 |
| 064-012 | LYNN LAKE,Z-DEPOSIT | 064 C 14 | 56 49 57 | 101 01 30 |
| 065-001 | HENINGA LAKE(GEMEX) | 065 H 16 | 61 46 25 | 096 12 10 |
| 075-003 | INDIAN MOUNTAIN | 075 M 02 | 63 01 57 | 110 56 57 |
| 076-002 | HACKETT RIVER (MAIN ZONE) | 076 F 16 | 65 55 55 | 108 27 30 |
| 076-003 | HACKETT RIVER (EAST CLEAVER) | 076 F 16 | 65 55 00 | 108 27 29 |
| 076-004 | HIGH LAKE | 076 M 07 | 67 22 45 | 110 51 20 |
| 076-005 | YAVA | 076 G 12 | 65 36 40 | 107 56 11 |
| 076-006 | HACKETT RIVER (BOOT LAKE) | 076 F 16 | 65 54 46 | 108 26 15 |
| 082-078 | HOMESTAKE | 082 M 04 | 51 06 35 | 119 49 20 |
| 082-122 | GOLDSTREAM | 082 M 09 | 51 36 45 | 118 23 30 |
| 086-001 | IZOK | 086 H 10 | 65 39 | 112 49 00 |
| 086-002 | HOOD RIVER #10 | 086 I 02 | 66 04 | 112 45 |
| 086-003 | HOOD RIVER #41 | 086 I 02 | 66 02 30 | 112 48 |
| 092-002 | WESTMIN (LYNX,MYRA,PRICE) | 092 F 12 | 49 34 32 | 125 36 07 |
| 092-007 | TEDI(BRANDYWINE) VAN SILVER | 092 J 03 | 50 05 | 123 08 30 |
| 092-014 | CHU-CHUA | 092 P 08 | 51 23 | 120 03 |
| 092-015 | TWIN J | 092 B 13 | 48 52 | 123 47 |
| 092-016 | WESTMIN (HW) | 092 F 12 | 49 34 00 | 125 35 15 |
| 103-001 | ECSTALL RIVER | 103 H 13 | 53 52 12 | 129 30 36 |
| 104-003 | TULSEQUAH CHIEF | 104 K 12 | 58 44 20 | 133 34 30 |
| 104-005 | BIG BULL | 104 K 12 | 58 40 | 133 32 20 |
| 104-010 | KUTCHO CREEK | 104 I 01 | 58 12 10 | 128 21 40 |
| 116-001 | HART RIVER | 116 A 10 | 64 38 10 | 136 49 00 |

## APPENDIX B

## LISTING OF CANADIAN LEAD-ZINC DEPOSITS, ALPHABETICALLY BY DEPOSIT TYPE

### CONTACT METASOMATIC

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| CALEDONIA | 092-010 | 092 L 12 | 50 38 45 | 127 36 30 |
| LIME HILL | 011-007 | 011 F 14 | 45 46 35 | 061 09 00 |
| LYNN CREEK | 092-008 | 092 G 06 | 49 25 30 | 123 03 56 |
| MCDAME BELLE | 104-001 | 104 P 06 | 59 16 18 | 129 22 20 |
| MEAT COVE | 011-009 | 011 N 02 | 47 00 20 | 060 35 24 |
| VIECO WHIPSAW/ RAM & ROD | 095-006 | 095 E 11 | 61 33 40 | 127 27 15 |
| ZIP | 092-013 | 092 L 07 | 50 21 50 | 126 54 40 |

### MISSISSIPPI VALLEY

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| BEAR-TWIT | 106-003 | 106 A 03 | 64 02 | 129 19 |
| ECLIPSE | 068-002 | 068 H 09 | 75 31 30 | 096 08 |
| GAY'S RIVER | 011-001 | 011 E 03 | 45 01 | 063 21 50 |
| GAYNA | 106-007 | 106 B 15 | 64 57 | 130 43 |
| GIANT / SILVER GIANT | 082-071 | 082 K 16 | 50 56 06 | 116 28 18 |
| KICKING HORSE / MONARCH | 082-097 | 082 N 08 | 51 25 30 | 116 26 45 |
| LAKE MONTE | 034-001 | 034 C 02 | 56 06 | 076 32 |
| NANCY ISLAND | 033-002 | 033 N 15 | 55 57 30 | 076 48 |
| NANISIVIK | 048-001 | 048 C 01 | 73 03 40 | 084 30 30 |
| NEWFOUNDLAND ZINC | 012-006 | 012 I 06 | 50 17 42 | 057 28 00 |
| PINE POINT DISTRICT | 085-002 | 085 B 15 | 60 47 00 | 114 35 00 |
| POLARIS | 068-001 | 068 H 08 | 75 23 10 | 096 56 |
| ROBB LAKE | 094-004 | 094 B 13 | 56 56 30 | 123 43 40 |
| RUBY LAKE | 033-001 | 033 N 15 | 55 56 42 | 076 44 |
| SILVER BASIN | 082-152 | 082 K 10 | 50 41 20 | 116 44 40 |
| WESTMIN (AX GROUP) | 085-009 | 085 B 11 | 60 44 32 | 115 03 20 |

### SANDSTONE LEAD

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| GEORGE LAKE | 064-010 | 064 E 05 | 57 28 30 | 103 45 15 |
| YAVA (SILVERMINE) | 011-012 | 011 F 16 | 45 52 | 060 23 45 |

SEDIMENT-HOSTED EXHALATIVE

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| ANNEX | 082-002 | 082 F 03 | 49 00 48 | 117 22 18 |
| CIRQUE | 094-005 | 094 F 11 | 57 31 | 125 09 |
| COLBY | 082-128 | 082 L 10 | 50 43 45 | 118 44 |
| COTTON BELT | 082-079 | 082 M 07 | 51 27 00 | 118 49 12 |
| DUNCAN | 082-062 | 082 K 07 | 50 22 12 | 116 57 00 |
| DY | 105-033 | 105 K 03 | 62 14 | 133 02 |
| FARO | 105-002 | 105 K 06 | 62 21 30 | 133 22 00 |
| FERGUSON | 094-002 | 094 C 11 | 56 41 20 | 125 10 30 |
| GOZ | 106-005 | 106 C 07 | 64 25 | 132 32 |
| GRUM | 105-032 | 105 K 06 | 62 16 10 | 133 13 20 |
| H.B. | 082-005 | 082 F 03 | 49 08 48 | 117 12 00 |
| HOWARD'S PASS | 105-027 | 105 I 06 | 62 27 | 129 11 |
| JASON | 105-034 | 105 O 01 | 63 08 50 | 130 15 40 |
| JERSEY | 082-004 | 082 F 03 | 49 05 55 | 117 13 15 |
| KOOTENAY KING | 082-117 | 082 G 12 | 49 44 35 | 115 36 40 |
| LAFONTAINE | 031-031 | 031 J 04 | 46 05 50 | 075 57 15 |
| LEITCH | 031-030 | 031 J 04 | 46 06 50 | 075 57 12 |
| LONG LAKE | 031-005 | 031 C 10 | 44 41 23 | 076 46 20 |
| MEL GROUP | 095-005 | 095 D 06 | 60 21 05 | 127 24 15 |
| MINERAL KING | 082-065 | 082 K 08 | 50 20 45 | 116 25 35 |
| MOSQUITO KING | 082-127 | 082 M 04 | 51 02 30 | 119 31 |
| PARADISE | 082-066 | 082 K 08 | 50 28 25 | 116 18 20 |
| QUARTZ LAKE (MCMILLAN) | 095-004 | 095 D 05 | 60 29 55 | 127 56 50 |
| REEVES MACDONALD (REMAC) | 082-003 | 082 F 03 | 49 01 12 | 117 22 15 |
| RENMAC | 031-007 | 031 F 07 | 45 24 45 | 076 42 20 |
| RIVER JORDAN | 082-073 | 082 M 01 | 51 07 48 | 118 24 36 |
| SMITHFIELD | 011-003 | 011 E 06 | 45 16 20 | 063 04 30 |
| SULLIVAN | 082-055 | 082 F 09 | 49 42 30 | 116 00 20 |
| SWIM LAKE | 105-001 | 105 K 03 | 62 12 30 | 133 02 00 |
| TOM | 105-003 | 105 O 01 | 63 10 10 | 130 08 20 |
| VANGORDA | 105-005 | 105 K 06 | 62 15 10 | 133 11 00 |
| WALTON | 021-030 | 021 H 01 | 45 12 20 | 064 02 30 |
| WIGWAM | 082-070 | 082 K 13 | 50 52 48 | 117 58 48 |

**APPENDIX B (CONT.)**

VEIN AND REPLACEMENT

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| ADAMS PLATEAU / LUCKY COON | 082-147 | 082 M 04 | 51 04 00 | 119 37 10 |
| ALTOONA GROUP | 082-108 | 082 F 14 | 49 59 34 | 117 14 40 |
| AMERICAN BOY | 082-138 | 082 F 14 | 49 59 24 | 117 12 18 |
| ANTOINE SILVER | 082-126 | 082 K 03 | 50 00 09 | 117 11 53 |
| ARLINGTON | 082-144 | 082 F 14 | 49 47 30 | 117 21 38 |
| ARSENAULT LAKE | 022-011 | 022 A 06 | 48 22 12 | 065 13 20 |
| BANKER | 082-143 | 082 F 10 | 49 43 42 | 116 54 52 |
| BARB - MATT BERRY | 105-011 | 105 H 06 | 61 28 00 | 129 25 00 |
| BELL | 082-129 | 082 F 14 | 49 59 28 | 117 09 45 |
| BERENS RIVER | 053-003 | 053 C 13 | 52 50 30 | 093 38 22 |
| BIG CANYON | 104-007 | 104 N 12 | 59 44 10 | 133 31 |
| BLUEBELL | 082-052 | 082 F 15 | 49 45 33 | 116 51 43 |
| BOSUN | 082-048 | 082 F 14 | 49 58 25 | 117 21 43 |
| BRADINA | 093-004 | 093 L 02 | 54 07 20 | 126 43 00 |
| BRANDYWINE-NORTHAIR | 092-006 | 092 J 03 | 50 07 30 | 123 06 |
| BROADVIEW | 082-149 | 082 K 11 | 50 41 50 | 117 29 30 |
| CALEDONIA | 082-150 | 082 K 03 | 50 01 40 | 117 06 02 |
| CANDEGO | 022-008 | 022 G 01 | 49 03 48 | 066 04 06 |
| CARNATION | 082-106 | 082 F 14 | 49 58 06 | 117 16 25 |
| CLARK | 106-006 | 106 D 02 | 64 07 22 | 134 57 06 |
| COMSTOCK KENO | 105-018 | 105 M 14 | 63 56 23 | 135 12 15 |
| COPPER CROWN | 093-006 | 093 L 10 | 54 33 30 | 126 43 45 |
| CORK PROVINCE | 082-034 | 082 F 14 | 49 54 31 | 117 04 26 |
| CRONIN-BABINE | 093-002 | 093 L 15 | 54 55 00 | 126 48 20 |
| DELHI PACIFIC | 041-016 | 041 P 01 | 47 08 40 | 080 21 40 |
| DIXIE | 105-025 | 105 M 14 | 63 54 48 | 135 27 51 |
| DORION | 052-003 | 052 A 15 | 48 50 05 | 088 39 32 |
| DUNBRACK | 011-002 | 011 D 14 | 44 49 08 | 063 11 31 |
| DUNWELL | 103-004 | 103 P 13 | 55 59 45 | 129 55 25 |
| DUTHIE | 093-005 | 093 L 14 | 54 46 23 | 127 21 20 |
| ELSA | 105-021 | 105 M 14 | 63 54 37 | 135 28 42 |
| EMERALD-GLACIER | 093-001 | 093 E 11 | 53 44 20 | 127 15 45 |
| ENTERPRISE | 082-137 | 082 F 14 | 49 49 12 | 117 19 35 |
| ESTELLA | 082-056 | 082 G 13 | 49 46 20 | 115 37 |
| FEDERAL | 022-007 | 022 B 16 | 48 46 24 | 066 08 12 |
| FENSOM PROSPECT/ELLA LAKE | 041-003 | 041 I 05 | 46 18 18 | 081 32 26 |
| FORMO | 105-024 | 105 M 14 | 63 56 41 | 135 21 57 |
| FRONTENAC | 031-004 | 031 C 07 | 44 28 29 | 076 31 17 |
| GALENA FARM | 082-040 | 082 F 14 | 49 55 48 | 117 21 25 |
| GALKENO | 105-017 | 105 M 14 | 63 55 42 | 135 21 30 |
| GOODENOUGH | 082-146 | 082 F 06 | 49 19 12 | 117 11 00 |
| HANNAM | 042-011 | 042 D 15 | 48 48 24 | 086 41 28 |
| HANSON LAKE | 063-047 | 063 L 10 | 54 40 30 | 102 51 00 |
| HAWK CREEK / ALBION | 082-123 | 082 N 01 | 51 06 10 | 116 02 40 |
| HECTOR-CALUMET | 105-014 | 105 M 14 | 63 55 06 | 135 23 36 |
| HEWITT | 082-046 | 082 F 14 | 49 55 35 | 117 18 00 |
| HIGHLAND | 082-053 | 082 F 15 | 49 45 30 | 116 56 30 |

VEIN AND REPLACEMENT (CONT.)

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| HIGHLAND BELL | 082-013 | 082 E 06 | 49 26 | 119 03 45 |
| HIGHLANDER | 082-032 | 082 F 10 | 49 43 09 | 116 54 30 |
| HUSKY | 105-015 | 105 M 13 | 63 54 35 | 135 30 35 |
| IDAHO-ALAMO | 082-089 | 082 F 14 | 49 59 08 | 117 18 15 |
| INDIAN | 104-009 | 104 B 01 | 56 04 45 | 130 02 |
| IVANHOE | 082-051 | 082 F 14 | 49 57 28 | 117 14 23 |
| JACKSON | 082-118 | 082 K 03 | 50 00 14 | 117 09 42 |
| JARDUN | 041-010 | 041 K 09 | 46 38 10 | 084 08 09 |
| KENO HILL | 105-006 | 105 M 14 | 63 55 45 | 135 14 30 |
| KEYMET | 021-018 | 021 P 13 | 47 48 00 | 065 48 38 |
| KEYSTONE | 082-148 | 082 K 03 | 50 03 15 | 117 07 54 |
| KINGDON | 031-003 | 031 F 08 | 45 24 00 | 076 13 00 |
| KOOTENAY FLORENCE | 082-020 | 082 F 15 | 49 46 | 116 55 30 |
| LA MANCHE | 001-003 | 001 N 12 | 47 41 20 | 053 56 15 |
| LAST CHANCE | 082-139 | 082 F 14 | 49 59 40 | 117 12 08 |
| LUCKY JIM | 082-061 | 082 K 03 | 50 01 56 | 117 11 59 |
| LUCKY QUEEN | 105-008 | 105 M 14 | 63 57 11 | 135 15 00 |
| LUCKY THOUGHT | 082-135 | 082 F 14 | 49 56 20 | 117 18 05 |
| LUSTDUST | 093-008 | 093 N 11 | 55 33 30 | 125 25 |
| MAMMOTH | 082-037 | 082 F 14 | 49 57 42 | 117 17 15 |
| MASTODON | 082-074 | 082 M 01 | 51 14 07 | 118 07 05 |
| MATARROW | 041-023 | 041 P 15 | 47 54 30 | 080 44 20 |
| MOLLY GIBSON | 082-033 | 082 F 11 | 49 44 12 | 117 09 00 |
| MONTEZUMA GROUP | 082-109 | 082 F 14 | 49 56 20 | 117 03 20 |
| MOUNT PLEASANT NORTH AREA | 021-032 | 021 G 07 | 45 26 34 | 066 49 16 |
| NAMELESS & AUGUST FRACTIONS | 082-133 | 082 F 15 | 49 47 | 116 55 |
| NETTIE LAKE | 082-120 | 082 K 11 | 50 41 17 | 117 26 55 |
| NIGADOO | 021-019 | 021 P 12 | 47 43 40 | 065 47 54 |
| NO CASH | 105-020 | 105 M 14 | 63 55 17 | 135 25 54 |
| NOBLE FIVE | 082-039 | 082 F 14 | 49 59 31 | 117 12 01 |
| NORTH STAR | 103-003 | 103 P 12 | 55 41 10 | 129 30 50 |
| NORTH STAR | 082-031 | 082 F 09 | 49 40 53 | 116 01 30 |
| O'CONNOR LAKE | 075-004 | 075 E 05 | 61 19 36 | 111 47 30 |
| ODYNO / NEW NORZONE | 032-024 | 032 D 03 | 48 07 36 | 079 10 48 |
| ONEK | 105-016 | 105 M 14 | 63 54 47 | 135 17 22 |
| ORE HILL | 082-016 | 082 F 03 | 49 07 30 | 117 08 40 |
| PANET | 021-011 | 021 L 09 | 46 35 15 | 070 13 10 |
| PAYNE | 082-104 | 082 K 03 | 50 00 25 | 117 13 49 |
| PESO-REX | 106-002 | 106 D 04 | 64 00 45 | 135 57 20 |
| PILGRIM, CATHERINE | 092-012 | 092 L 06 | 50 26 07 | 127 24 00 |
| PLANET / STUMP | 092-004 | 092 I 08 | 50 20 | 120 23 30 |
| PORTER IDAHO | 103-010 | 103 P 13 | 55 54 02 | 129 55 46 |
| PORTLAND CANAL | 103-009 | 103 P 13 | 55 58 21 | 129 54 50 |
| PRAIRIE CREEK | 095-003 | 095 F 10 | 61 33 35 | 124 47 30 |
| PROSPERITY | 103-007 | 103 P 13 | 55 54 12 | 129 56 00 |
| QUEBEC CHIBOUGAMAU(MERRILL IS) | 032-270 | 032 G 16 | 49 52 18 | 074 19 18 |
| QUEBEC STURGEON - HACHEY | 021-098 | 021 P 12 | 47 40 16 | 065 54 53 |

## APPENDIX B (CONT.)

VEIN AND REPLACEMENT (CONT.)

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| QUEBEC STURGEON - HALF MILE | 021-096 | 021 P 12 | 47 40 42 | 065 53 22 |
| QUEBEC STURGEON - PINE TREE | 021-099 | 021 P 12 | 47 40 46 | 065 52 55 |
| QUEBEC STURGEON - SHAFT | 021-097 | 021 P 12 | 47 40 21 | 065 54 46 |
| QUEEN BESS | 082-136 | 082 F 14 | 49 59 28 | 117 16 45 |
| RAMBLER-CARIBOO | 082-059 | 082 K 03 | 50 00 44 | 117 11 33 |
| RECO (1,2,3,4) | 082-132 | 082 F 14 | 49 59 35 | 117 11 18 |
| RICHMOND EUREKA | 082-043 | 082 F 14 | 49 58 01 | 117 13 04 |
| ROUND POND | 012-022 | 012 P 08 | 51 16 05 | 056 15 15 |
| RUTH VERMONT | 082-107 | 082 K 15 | 50 56 55 | 116 58 55 |
| RUTH-HOPE | 082-038 | 082 F 14 | 49 58 10 | 117 13 50 |
| SADIE-LADUE | 105-023 | 105 M 14 | 63 57 07 | 135 16 54 |
| SCRANTON | 082-110 | 082 F 14 | 49 47 15 | 117 03 35 |
| SILMONAC | 082-151 | 082 F 14 | 49 58 | 117 14 45 |
| SILVER CLIFF | 001-001 | 001 N 05 | 47 18 15 | 053 56 45 |
| SILVER CUP | 082-121 | 082 K 11 | 50 38 10 | 117 23 10 |
| SILVER CUP | 093-009 | 093 M 05 | 55 21 09 | 127 30 45 |
| SILVER KING | 105-019 | 105 M 13 | 63 53 48 | 135 34 03 |
| SILVER QUEEN/MAGNO/MARBLE CK | 104-008 | 104 P 05 | 59 15 30 | 129 49 35 |
| SILVER STANDARD | 093-003 | 093 M 05 | 55 19 02 | 127 37 35 |
| SILVERSMITH | 082-044 | 082 F 14 | 49 58 00 | 117 13 22 |
| SNOWFLAKE / STANN TR | 082-087 | 082 N 04 | 51 11 45 | 117 44 00 |
| SPIDER & ECLIPSE | 082-069 | 082 K 13 | 50 46 25 | 117 37 40 |
| SPOKANE | 082-140 | 082 F 10 | 49 44 08 | 116 55 06 |
| ST. EUGENE | 082-054 | 082 G 05 | 49 17 00 | 115 49 06 |
| STACKPOOL / JEFFERSON | 041-022 | 041 O 16 | 47 50 04 | 082 12 16 |
| STANDARD | 082-050 | 082 F 14 | 49 57 22 | 117 19 08 |
| STUMP | 105-013 | 105 F 09 | 61 31 30 | 132 11 00 |
| SUNSET | 082-130 | 082 F 14 | 49 59 20 | 117 09 56 |
| SUNSHINE | 092-005 | 092 I 07 | 50 18 42 | 120 45 42 |
| SURPRISE | 082-047 | 082 F 14 | 49 59 55 | 117 11 42 |
| TEDDY GLACIER | 082-113 | 082 K 13 | 50 51 45 | 117 45 10 |
| TOWNSITE | 105-026 | 105 M 14 | 63 54 50 | 135 24 30 |
| TRUE FISSURE | 082-068 | 082 K 11 | 50 42 15 | 117 30 |
| UPTON | 031-022 | 031 H 10 | 45 41 | 072 40 |
| UTICA | 082-111 | 082 F 14 | 49 58 35 | 117 07 35 |
| VAN ROI | 082-041 | 082 F 14 | 49 55 50 | 117 17 13 |
| VENUS | 105-012 | 105 D 02 | 60 01 13 | 134 37 45 |
| VICTOR / VIOLAMAC | 082-036 | 082 F 14 | 49 59 54 | 117 16 19 |
| VIGILANT | 082-131 | 082 F 15 | 49 47 | 116 56 |
| WASHINGTON | 082-119 | 082 K 03 | 50 00 18 | 117 13 04 |
| WELLINGTON-BOUNTY | 082-145 | 082 E 06 | 49 26 | 119 06 30 |
| WHIPSAW-EUREKA | 105-022 | 105 M 14 | 63 54 25 | 135 15 35 |
| WHITEWATER | 082-028 | 082 K 03 | 50 02 57 | 117 07 58 |
| WONDERFUL | 082-105 | 082 F 14 | 49 58 50 | 117 14 50 |
| WRIGHT | 031-002 | 031 M 06 | 47 25 24 | 079 29 30 |
| YANKEE GIRL | 082-022 | 082 F 06 | 49 17 23 | 117 11 10 |

**APPENDIX B (CONT.)**

VOLCANIC-ASSOCIATED EXHALATIVE

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| ABITIBI SILVER / FREBERT | 032-020 | 032 C 12 | 48 31 42 | 077 41 54 |
| AMULET A | 032-034 | 032 D 06 | 48 18 15 | 079 04 00 |
| AMULET C | 032-263 | 032 D 06 | 48 18 20 | 079 04 15 |
| AMULET F | 032-033 | 032 D 06 | 48 19 00 | 079 04 42 |
| ANDERSON | 063-053 | 063 J 13 | 54 51 35 | 099 59 35 |
| ANTOINETTE LAKE GROUP TACHE LK | 032-063 | 032 G 16 | 49 56 30 | 074 24 20 |
| ARMSTRONG ZONE A-SOUTH LENS | 021-054 | 021 O 09 | 47 36 05 | 066 02 31 |
| AUSTIN BROOK | 021-038 | 021 P 05 | 47 23 52 | 065 49 24 |
| BARVALLEE | 032-013 | 032 C 05 | 48 25 42 | 077 40 50 |
| BARVUE | 032-022 | 032 C 12 | 48 31 18 | 077 40 30 |
| BELFORT ROYMONT | 032-014 | 032 C 05 | 48 25 47 | 077 40 54 |
| BELL ALLARD SOUTH GROUP | 032-053 | 032 F 12 | 49 41 18 | 077 41 54 |
| BELL CHANNEL | 032-058 | 032 F 13 | 49 46 12 | 077 37 30 |
| BIG BULL | 104-005 | 104 K 12 | 58 40 | 133 32 20 |
| BIG NAMA CREEK | 042-013 | 042 F 04 | 49 09 51 | 085 50 46 |
| BOB LAKE | 063-041 | 063 N 03 | 55 09 30 | 101 02 45 |
| BOMBER | 063-037 | 063 K 16 | 54 51 50 | 100 10 45 |
| BRUNSWICK #12 | 021-036 | 021 P 05 | 47 28 28 | 065 53 24 |
| BRUNSWICK #6 | 021-035 | 021 P 05 | 47 24 20 | 065 49 17 |
| BUCHANS | 012-009 | 012 A 15 | 48 49 20 | 056 51 52 |
| CALUMET | 031-027 | 031 F 10 | 45 42 00 | 076 40 48 |
| CANADIAN JAMIESON | 042-003 | 042 A 12 | 48 32 06 | 081 34 06 |
| CANOE LANDING | 021-049 | 021 O 08 | 47 24 38 | 066 06 16 |
| CARIBOU | 021-016 | 021 O 09 | 47 33 43 | 066 17 48 |
| CENTENNIAL | 063-013 | 063 K 12 | 54 42 03 | 101 39 59 |
| CHESTER | 021-026 | 021 O 01 | 47 05 58 | 066 13 48 |
| CHISEL LAKE | 063-033 | 063 K 16 | 54 49 48 | 100 06 45 |
| CHU-CHUA | 092-014 | 092 P 08 | 51 23 | 120 03 |
| CLINTON COPPER | 021-002 | 021 E 07 | 45 27 36 | 070 54 30 |
| CONIAGAS | 032-048 | 032 F 08 | 49 29 54 | 076 09 48 |
| CONIGO - WEST CU-ZN-AG ZONE | 032-271 | 032 D 09 | 48 35 49 | 078 03 30 |
| CONIGO - WEST UPPER AG-ZN ZONE | 032-272 | 032 D 09 | 48 35 49 | 078 03 28 |
| CONSOLIDATED PERSHCOURT | 032-018 | 032 C 12 | 48 31 24 | 077 41 06 |
| CONSOLIDATED RAMBLER MAIN | 012-008 | 012 H 16 | 49 53 33 | 056 05 00 |
| COPPER LODE-E ZONE | 052-017 | 052 K 15 | 50 58 00 | 092 52 40 |
| COPPER REEF | 063-056 | 063 K 12 | 54 36 45 | 101 36 24 |
| COPPER-MAN | 063-004 | 063 J 12 | 54 39 00 | 099 52 30 |
| CORBET | 032-265 | 032 D 06 | 48 18 00 | 079 04 54 |
| CREEK ZONE | 052-020 | 052 G 15 | 49 52 54 | 090 53 07 |
| CUPRA-D'ESTRIE | 021-009 | 021 E 14 | 45 46 20 | 071 18 40 |
| CUPRUS | 063-012 | 063 K 12 | 54 43 12 | 101 42 48 |
| D-266 (LD-75) | 032-267 | 032 D 06 | 48 18 14 | 079 03 39 |
| DELBRIDGE | 032-035 | 032 D 07 | 48 15 54 | 078 57 48 |
| DH-FL GROUP | 064-007 | 064 C 14 | 56 50 00 | 101 00 30 |
| DICKSTONE | 063-035 | 063 K 16 | 54 51 12 | 100 29 50 |
| DYCE SIDING (SYLVIA ZONE) | 063-051 | 063 K 08 | 54 24 25 | 100 08 57 |
| EAST WAITE | 032-030 | 032 D 06 | 48 20 36 | 079 04 42 |

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| ECSTALL RIVER | 103-001 | 103 H 13 | 53 52 12 | 129 30 36 |
| EMBURY (TROUT) LAKE | 063-055 | 063 K 13 | 54 49 45 | 101 49 30 |
| EMPIRE OIL LETAC | 032-046 | 032 F 08 | 49 26 48 | 076 09 30 |
| ERRINGTON | 041-004 | 041 I 11 | 46 32 00 | 081 16 28 |
| FLIN FLON | 063-021 | 063 K 13 | 54 45 39 | 101 52 42 |
| FOX LAKE | 064-006 | 064 C 12 | 56 38 05 | 101 37 50 |
| GARON LAKE | 032-059 | 032 F 13 | 49 46 10 | 077 34 04 |
| GECO | 042-015 | 042 F 04 | 49 09 15 | 085 47 40 |
| GHOST LAKE | 063-034 | 063 K 16 | 54 49 18 | 100 04 48 |
| GOLDSTREAM | 082-122 | 082 M 09 | 51 36 45 | 118 23 30 |
| HACKETT RIVER (BOOT LAKE) | 076-006 | 076 F 16 | 65 54 46 | 108 26 15 |
| HACKETT RIVER (EAST CLEAVER) | 076-003 | 076 F 16 | 65 55 00 | 108 27 29 |
| HACKETT RIVER (MAIN ZONE) | 076-002 | 076 F 16 | 65 55 55 | 108 27 30 |
| HALF MILE LAKE (KEEVIL) | 021-051 | 021 O 08 | 47 19 20 | 066 18 07 |
| HALF MILE LAKE (T.G.S.) | 021-022 | 021 O 08 | 47 18 23 | 066 19 32 |
| HALF MILE LAKE(CONWEST) | 021-053 | 021 O 08 | 47 18 57 | 066 18 39 |
| HART RIVER | 116-001 | 116 A 10 | 64 38 10 | 136 49 00 |
| HEADVUE | 042-017 | 042 L 04 | 50 01 14 | 087 39 38 |
| HEATH STEELE BOUNDARY ZONE | 021-101 | 021 O 08 | 47 18 24 | 066 07 48 |
| HEATH STEELE GROUP | 021-037 | 021 O 08 | 47 17 28 | 066 04 55 |
| HENINGA LAKE(GEMEX) | 065-001 | 065 H 16 | 61 46 25 | 096 12 10 |
| HIGH LAKE | 076-004 | 076 M 07 | 67 22 45 | 110 51 20 |
| HOMESTAKE | 082-078 | 082 M 04 | 51 06 35 | 119 49 20 |
| HOOD RIVER #10 | 086-002 | 086 I 02 | 66 04 | 112 45 |
| HOOD RIVER #41 | 086-003 | 086 I 02 | 66 02 30 | 112 48 |
| INDIAN MOUNTAIN | 075-003 | 075 M 02 | 63 01 57 | 110 56 57 |
| IZOK | 086-001 | 086 H 10 | 65 39 | 112 49 00 |
| JAMELAND | 042-004 | 042 A 12 | 48 35 00 | 081 35 00 |
| JOUTEL COPPER | 032-042 | 032 E 08 | 49 28 | 078 23 |
| JUNGLE | 063-039 | 063 N 02 | 55 10 | 100 58 |
| KAM KOTIA | 042-005 | 042 A 12 | 48 35 36 | 081 37 00 |
| KELLY DESMOND | 032-040 | 032 E 08 | 49 26 06 | 078 19 52 |
| KENDON | 042-018 | 042 L 05 | 50 25 30 | 087 36 40 |
| KEY ANACON /MIDDLE LANDING | 021-024 | 021 P 05 | 47 26 12 | 065 42 00 |
| KIDD CREEK | 042-002 | 042 A 11 | 48 41 30 | 081 21 55 |
| KNOBBY LAKE (SAND 4) | 064-003 | 064 B 13 | 56 53 30 | 099 54 |
| KUTCHO CREEK | 104-010 | 104 I 01 | 58 12 10 | 128 21 40 |
| LA GAUCHETIERE | 032-259 | 032 E 16 | 49 46 29 | 078 09 19 |
| LA RIBOURDE-SAUSSURE | 032-268 | 032 G 13 | 49 48 30 | 075 32 |
| LAKE DUFAULT NO 2 | 032-028 | 032 D 06 | 48 18 12 | 079 03 48 |
| LAKE GENEVA | 041-008 | 041 I 13 | 46 47 24 | 081 30 55 |
| LEMOINE TWP. | 032-258 | 032 G 16 | 49 45 44 | 074 06 10 |
| LES MINES SELBAIE(A-1,B ZONES) | 032-262 | 032 E 15 | 49 47 | 078 55 |
| LESSARD OPTION | 032-261 | 032 J 10 | 50 38 30 | 074 38 30 |
| LINGWICK | 021-041 | 021 E 11 | 45 39 18 | 071 23 |
| LOST LAKE | 063-049 | 063 K 16 | 54 49 | 100 05 |
| LOUVEM | 032-257 | 032 C 04 | 48 05 54 | 077 31 12 |

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| LYNN LAKE,Z-DEPOSIT | 064-012 | 064 C 14 | 56 49 57 | 101 01 30 |
| LYNX (OBASKA) | 032-023 | 032 F 12 | 49 38 48 | 077 43 18 |
| LYON LAKE | 052-016 | 052 G 15 | 49 53 06 | 090 53 30 |
| MAGUSI RIVER | 032-260 | 032 D 06 | 48 26 27 | 079 22 21 |
| MANDY | 063-014 | 063 K 12 | 54 43 40 | 101 49 56 |
| MANITOU BARVUE | 032-010 | 032 C 04 | 48 05 12 | 077 36 36 |
| MARSHALL LAKE | 042-023 | 042 L 05 | 50 25 25 | 087 35 20 |
| MATTABI | 052-006 | 052 G 15 | 49 52 36 | 090 58 06 |
| MATTAGAMI LAKE | 032-052 | 032 F 12 | 49 43 00 | 077 43 00 |
| MILLENBACH | 032-070 | 032 D 06 | 48 18 04 | 079 03 15 |
| MINES GALLEN (WEST MACDONALD) | 032-031 | 032 D 07 | 48 19 36 | 078 57 12 |
| MOBRUN | 032-036 | 032 D 07 | 48 23 24 | 078 54 00 |
| MONPAS (ALBARMONT) | 032-019 | 032 C 12 | 48 36 54 | 077 52 12 |
| MOULTON HILL | 021-007 | 021 E 05 | 45 25 35 | 071 48 48 |
| MURRAY BROOK | 021-014 | 021 O 09 | 47 31 06 | 066 25 54 |
| NEPISGUIT | 021-045 | 021 O 08 | 47 22 26 | 066 02 10 |
| NEW HOSCO | 032-060 | 032 F 13 | 49 47 24 | 077 50 06 |
| NEWCONEX FIGUERY | 032-264 | 032 D 08 | 48 28 45 | 078 10 15 |
| NINEMILE BROOK | 021-085 | 021 P 05 | 47 23 29 | 065 55 50 |
| NORBEC | 032-026 | 032 D 06 | 48 21 12 | 079 03 18 |
| NORITA (RADIORE A) | 032-056 | 032 F 13 | 49 46 00 | 077 39 18 |
| NORMETAL | 032-039 | 032 D 14 | 49 00 | 079 22 |
| NORTH TRINITY | 032-021 | 032 C 12 | 48 42 30 | 077 45 36 |
| OLD WAITE | 032-027 | 032 D 06 | 48 20 20 | 079 05 12 |
| ORCHAN | 032-055 | 032 F 12 | 49 42 30 | 077 42 30 |
| ORVAN BROOK | 021-017 | 021 O 09 | 47 37 42 | 066 08 11 |
| OSBORNE LAKE | 063-007 | 063 J 13 | 54 57 15 | 099 43 24 |
| PABINEAU RIVER | 021-091 | 021 P 05 | 47 26 48 | 065 54 38 |
| PEG | 064-011 | 064 D 04 | 56 07 20 | 103 42 00 |
| PENN-COBALT (FOSTER) | 031-029 | 031 M 05 | 47 22 20 | 079 39 55 |
| POINT LEAMINGTON | 002-023 | 002 E 05 | 49 17 15 | 055 35 35 |
| POIRIER | 032-041 | 032 E 08 | 49 26 43 | 078 23 03 |
| POT LAKE | 063-036 | 063 K 16 | 54 45 17 | 100 09 00 |
| POTTER (MUNRO) | 042-022 | 042 A 09 | 48 36 00 | 080 12 40 |
| PRUDHOMME NO 1 | 024-002 | 024 K 05 | 58 15 36 | 069 54 18 |
| QUEMONT | 032-032 | 032 D 06 | 48 15 30 | 079 00 24 |
| RADIORE EAST | 032-057 | 032 F 13 | 49 45 06 | 077 33 36 |
| RAIL LAKE | 063-032 | 063 K 10 | 54 44 30 | 100 35 25 |
| RAMSAY | 063-044 | 063 L 10 | 54 44 20 | 102 45 30 |
| RESTIGOUCHE/THIRD PORTAGE LAKE | 021-015 | 021 O 10 | 47 30 12 | 066 33 42 |
| ROCKY TURN | 021-023 | 021 O 09 | 47 37 59 | 066 04 18 |
| ROD(STALL) LAKE | 063-005 | 063 J 13 | 54 51 36 | 099 54 12 |
| RUTTAN | 064-002 | 064 B 05 | 56 28 36 | 099 38 06 |
| SCHIST LAKE | 063-015 | 063 K 12 | 54 43 10 | 101 49 35 |
| SCHOTTS LAKE | 063-045 | 063 M 01 | 55 05 45 | 102 13 35 |
| SCOTT TWP (SELCO) | 032-266 | 032 G 15 | 49 51 52 | 074 37 47 |
| SHERRIDON | 063-042 | 063 N 03 | 55 08 22 | 101 06 25 |

VOLCANIC-ASSOCIATED EXHALATIVE (CONT.)

| DEPOSIT NAME | DEP NUM | NTS AREA | LATITUDE | LONGITUDE |
|---|---|---|---|---|
| SHUNSBY | 041-019 | 041 O 10 | 47 42 48 | 082 39 30 |
| SOLBEC | 021-010 | 021 E 14 | 45 49 00 | 071 18 30 |
| SOMA ALTA | 032-243 | 032 F 08 | 49 25 31 | 076 08 12 |
| SOUCY NO 1 | 024-001 | 024 K 05 | 58 19 19 | 069 52 06 |
| SOUTH BAY | 052-008 | 052 N 02 | 51 06 35 | 092 40 45 |
| SPRUCE POINT | 063-011 | 063 K 09 | 54 34 30 | 100 24 00 |
| STALL | 063-054 | 063 J 13 | 54 51 20 | 099 56 30 |
| STIRLING | 011-006 | 011 F 09 | 45 43 40 | 060 26 15 |
| STRALAK | 041-007 | 041 I 13 | 46 48 09 | 081 41 50 |
| STRATMAT MAIN | 021-047 | 021 O 08 | 47 19 13 | 066 06 45 |
| STRATMAT WEST | 021-048 | 021 O 08 | 47 18 31 | 066 08 03 |
| STRATMAT-CENTRAL | 021-100 | 021 O 08 | 47 19 11 | 066 06 25 |
| STURGEON LAKE | 052-015 | 052 G 15 | 49 52 35 | 090 52 53 |
| SUFFIELD | 021-005 | 021 E 05 | 45 19 09 | 071 57 35 |
| TEAHAN | 021-028 | 021 H 10 | 45 43 | 064 59 30 |
| TEDI(BRANDYWINE) VAN SILVER | 092-007 | 092 J 03 | 50 05 | 123 08 30 |
| TETREAULT | 031-009 | 031 I 16 | 46 49 30 | 072 20 54 |
| TONNANCOURT-3 | 032-269 | 032 C 15 | 48 51 48 | 076 59 00 |
| TROUT BAY | 052-007 | 052 M 01 | 51 00 32 | 094 12 |
| TULK'S POND | 012-021 | 012 A 11 | 48 30 54 | 057 12 12 |
| TULSEQUAH CHIEF | 104-003 | 104 K 12 | 58 44 20 | 133 34 30 |
| TWIN J | 092-015 | 092 B 13 | 48 52 | 123 47 |
| UNITED MONTAUBAN | 031-020 | 031 I 16 | 46 50 24 | 072 20 42 |
| VAMP LAKE | 063-029 | 063 K 14 | 54 56 13 | 101 10 20 |
| VAUZE | 032-029 | 032 D 06 | 48 21 48 | 079 04 42 |
| VENDOME | 032-012 | 032 C 05 | 48 25 24 | 077 39 42 |
| VERMILION LAKE | 041-024 | 041 I 11 | 46 31 00 | 081 21 00 |
| WEDGE | 021-050 | 021 O 08 | 47 23 40 | 066 07 58 |
| WEEDON | 021-004 | 021 E 11 | 45 42 15 | 071 22 23 |
| WESTARM | 063-052 | 063 K 12 | 54 38 30 | 101 50 12 |
| WESTMIN (HW) | 092-016 | 092 F 12 | 49 34 00 | 125 35 15 |
| WESTMIN (LYNX,MYRA,PRICE) | 092-002 | 092 F 12 | 49 34 32 | 125 36 07 |
| WHITE LAKE | 063-016 | 063 K 12 | 54 42 50 | 101 43 40 |
| WILDNEST | 063-008 | 063 M 01 | 55 03 35 | 102 14 50 |
| WILLECHO | 042-012 | 042 F 04 | 49 10 30 | 085 52 48 |
| WILLROY | 042-014 | 042 F 04 | 49 09 27 | 085 49 28 |
| YAVA | 076-005 | 076 G 12 | 65 36 40 | 107 56 11 |
| YORK HARBOUR | 012-010 | 012 G 01 | 49 02 53 | 058 18 28 |
| ZENMAC | 042-006 | 042 D 14 | 48 58 50 | 087 21 30 |

## APPENDIX C

## SELECTED BIBLIOGRAPHY FOR CANADIAN LEAD-ZINC DEPOSITS, ARRANGED ALPHABETICALLY BY DEPOSIT-NAME

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## APPENDIX C (CONT.)

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MAPS NOT

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